SCIENTIFIC AMERICAN

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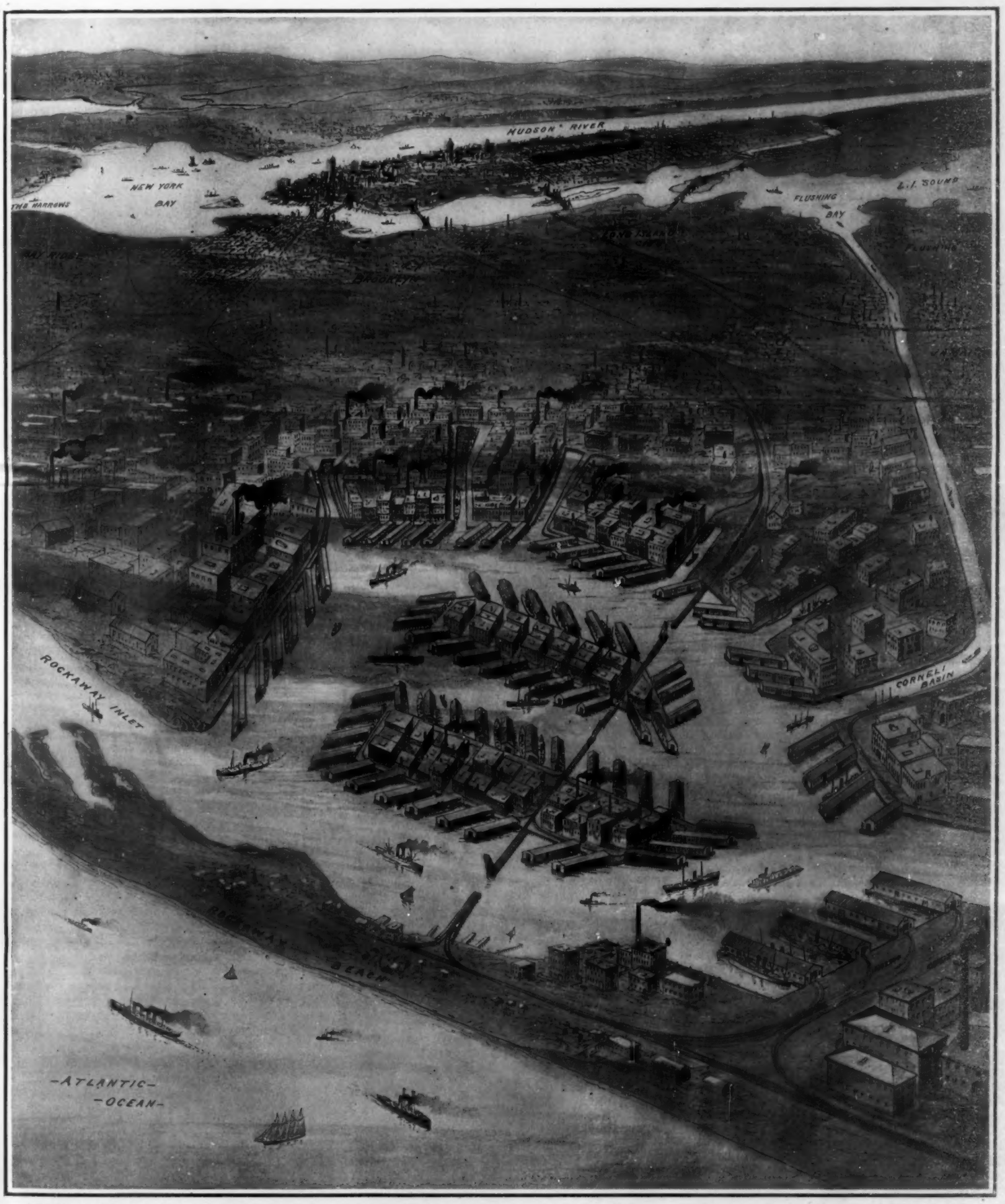

The city of New York in co-operation with the Federal government is about to begin at Jamaica Bay a scheme of construction of channels, bulkheads, and the reclamation of land which, when ultimately completed, will provide this port with 150 additional miles of water front.

THE JAMAICA BAY IMPROVEMENT.—[See page 9.]

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NEW YORK, SATURDAY, JULY 2nd, 1910.

The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the *facts authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

THE GOULD $15,000 PRIZE CONTEST.

IN making his generous offer of a $15,000 prize to promote the endurance and safety of the aeroplane, Mr. Edwin Gould has selected for improvement those qualities in which the aeroplane, in its present stage of development, is most deficient. In speed, stability, strength, and lightness, the machine has reached a stage of perfection which, considering that the art of flying is yet in its infancy, is truly remarkable. We do not recall any other art in which the early progress has been so rapid. Unquestionably, the weak point in the aeroplane, as it stands to-day, is its lack of endurance—and we say this with full appreciation of the sustained flights made by Curtiss and Hamilton in this country, and by Farman and Paulhan abroad. For we cannot lose sight of the fact that record flights of endurance are made only by the most experienced aviators, and after the machine has been subjected to careful overhauling and scrutiny by skilled mechanics. Moreover, when the aviator is once in the air, he realizes that his chances of remaining there depend absolutely upon the accurate running of a single engine, and the strength of a single propeller of fragile construction. Should a mishap befall the one or the other, the machine must there and then come down, no matter how unfavorable the country below may be for alighting.

Now, if travel through the air is to become as popular and safe as travel on land and sea, this element of uncertainty must be removed, and the question as to when or where a flight shall terminate must be determined, not, as at present, by the machine, but by its operator.

Experience in travel at sea has proved that endurance and safety can best be secured, other things being equal, by the division of the motive power into two or more units. We can all remember the frequency with which the single-screw Atlantic liners were disabled, and the long delays occasioned by finding and towing into port the crippled vessel. Twin screws and duplicate motive power have changed all that; and, to-day, the loss of a propeller or the breakdown of an engine involves no danger whatever, and no greater inconvenience than a delay of a day or two in reaching port. The further the subdivision of motive power is carried, the greater is the degree of safety, and the less the delay due to partial disablement. A notable instance of this was seen in the four-screw "Mauretania," which, after losing one of her propellers, on her next trip, made under three turbines and propellers, not only suffered no delay, but actually broke all her previous records for speed.

If the argument for subdivision be strong as applied to the sea, it is doubly so in its application to air navigation, where the dangers and difficulties of suddenly enforced descent are so great.

The offer of this $15,000 prize, then, is very timely. A few years ago, when motors were heavier and the framing and supporting surfaces were of clumsier construction, the duplicate-motor idea might have seemed chimerical. But the progress in the lightening of the construction has been so encouraging, that the multiple-unit idea no longer presents any serious difficulty on the ground of the increase of weight which would be involved.

Although the conditions for the contest are still under consideration, we wish to draw attention to one or two facts of importance which seem to have been overlooked. In the first place, competition for the prize is not limited to aeroplanes which carry two engines and two propellers. On the question of subdivision of motive power, the designer is given an absolutely free hand. He can divide it into as many units as he may think fit. Any construction that provides for "more than one engine and propeller" will be considered. Furthermore, some of our correspondents appear to have overlooked the fact that the competition is limited to machines that are designed and tried out in the United States. Since the announcement of the prize, we have received many letters from abroad, and notably from France, where the impression seems to prevail that the competition is thrown open to the world at large. In restricting this prize to the United States, it is the design of the donor to give a powerful stimulus to the perfecting of human flight in the country in which it had its birth.

THE ANNUAL SLAUGHTER OF TRESPASSERS ON RAILROADS.

IT is not generally understood how large a proportion of the deaths and injuries on the railroads of this country is due to the risks willfully taken by trespassers who persist in using the right-of-way as a public thoroughfare. The annual reports of the Interstate Commerce Commission for the past eleven years show that, during this period, 105,000 persons were killed or injured, and that of this total, some 50,000 were killed outright. The large ratio of fatalities to injuries, which is several times larger than the ratio that obtains in the case of accidents to passengers and employees, suggests that practically all of these accidents were due to trespassers being struck by moving trains. The records of the Commission show that in 1898, 4,063 trespassers lost their lives on American railroads; that five years later the number of killed was 5,000, and that in 1907 it rose to 5,612—that is to say, on every day of that year an average of over 15 people lost their lives entirely through their own folly in trespassing on the right-of-way of the railroads. Figures compiled by the Pennsylvania Railroad alone show that 465 passengers lost their lives on that system's lines in 1899, and 781 were killed in 1904; while in 1907 the number reached 915, an average of about three for every business day of the year. In the last-named year, this company inaugurated a vigorous campaign against trespassers, and as a result the number of fatalities in 1908 was reduced to 757.

There is no country in the world where the loss of life due to trespassing on railroads approaches these figures, not even if we take into consideration the smaller mileage of the railway systems in Europe and elsewhere. The difference is easily explained. It is due to the stringent laws in Europe against trespassing; to the careful policing of the tracks; and especially to the fact that violations of the law are invariably punished. Here in the United States, conditions are exceedingly lax. Some of the railroads, and notably the one referred to above, endeavor to enforce the law against trespassing on railroad property. The Pennsylvania Company exhibit thousands of warning signs along the right-of-way; but unfortunately, the actual punishment of persons violating the laws against thus trespassing has been infrequent, the cost of imprisonment often deterring the local courts from holding those who have been arrested by the watchmen.

The fatalities and injuries are most frequent where the railroads pass through manufacturing districts in which the tracks are lined with factories. The railroad frequently offers the shortest cut between the factory and the home; and statistics show that men of the laboring class, artisans, and their wives and children, are annually killed by the hundreds. Evidently, the remedy for this shocking slaughter, which stands as a distinct reproach against the civilization of America, is to be found in the thorough co-operation of city and country authorities with the railroads in the rigid enforcement of the law against trespass.

So long as the public realizes that warning placards, railroad watchmen, and laws against trespass, are subject to the caprice of local magistrates who look with a lenient eye upon offenders, trespassers will continue to walk on the track, and this horrible annual roll of deaths and injury will continue to increase.

TRANSPORTATION BY AIR.

THE successful 300-mile trip of the new Zeppelin passenger airship on Wednesday of last week, and the 109-mile flight of a Farman biplane with two army officers a fortnight before, are forcible auguries of the practical utilization of both lighter and heavier-than-air craft for the carrying of passengers. The new airship "Deutschland," piloted by Count Zeppelin himself, carried no less than 20 passengers from Friedrichshafen to Düsseldorf in the neighborhood of 9 hours time, and at an average speed of 33.33 miles an hour. During one hour of the journey a speed of 43½ miles an hour was averaged. The passengers were carried in a mahogany-finished cabin and had all the comforts of a Pullman car, but most significant fact of all, the trip was made upon schedule and with all the regularity of an express train.

These two brilliant performances of two representative types of air craft leave little doubt that in the future, and sooner than was generally supposed, we shall have air transportation lines of travel established.

A Farman biplane has already flown with four people, three of whom were passengers, while the latest Zeppelin airship, mentioned above, has on a trial trip carried twenty. This indicates that the aeroplane will be the touring car of the air, and the dirigible the aerial omnibus. Automobiles of both these types can transport passengers cheaper than do the railroads, even with the wear and tear of the expensive rubber tires, and the depreciation of the machinery allowed for. As the aeroplane, at least, requires little, if any, more power than the automobile for carrying the same load at the same or perhaps at a much faster speed, it is possible that this machine will ultimately replace the automobile for cross-country business trips. As examples of this we have only to cite the 4-mile trip (covered in 6 minutes) of Graham-White recently in his biplane, when he was haled to court in England for speeding his automobile. After the judge had fined him for speeding on *terra firma*, he sped back home by the air route safe from molestation. Another French aviator recently flew 60 miles or more to Paris to sign a contract to take part in an aviation meet. As soon as he transacted his business, he flew back again without mishap. Only two or three weeks ago the French war authorities, awakened by the message-carrying flights of Glenn Curtiss from Albany to New York, and of Charles K. Hamilton from New York to Philadelphia and back, commanded Blériot to take a message from Chalons to Paris. He jumped in his monoplane and forthwith carried the message to its destination. These last-mentioned flights show the practicability of carrying mail or light perishable freight by aeroplane. But the rapid and comfortable transportation of individuals will undoubtedly be the immediate outcome of the great improvements that are continually being made in dynamic flight.

PROPOSED AVIATION FIELD FOR NEW YORK.

IF the offer which has been made by W. K. Vanderbilt, Jr., to the practical aviators who are at present engaged in experimental flights on the field of the Aeronautical Society near Mineola, be accepted, aviation will receive a practical stimulus which should prove of great value in the development of the art. Mr. Vanderbilt proposes to turn over to the aviators, if they will organize a professional association, a portion of the Motor Parkway, including a large aviation field, for the purpose of holding public aviation meets and races. He offers to fence in several square miles of ground adjacent to the parkway and the grand stand; police it; roll the turf and put it in suitable condition; build flying-machine sheds; hire mechanics; supply all gasoline and other necessities; and pay all incidental expenses, including the hiring of ticket takers and other officials. In addition to this, he will furnish $20,000 as a working capital, lending this sum to the association. The repayment of this investment would be made from the first $20,000 that were taken in from the sale of the tickets at the race meets.

At the present time, experimental work is being carried on at the aviation field of the Aeronautical Society, which has built a large shed 50 by 150 feet in length, where several aeroplanes are at present under construction. This field is entirely free to the public, and the heavy expense incidental to the hiring of the ground and construction and maintenance of the plant, has been borne by the society, which has shown a most commendable spirit in undertaking this work solely with an eye to the promotion of aviation. The field is handicapped, however, by its limited size, and particularly by the fact that although the public secures its entertainment absolutely free of cost, it does not hesitate to crowd in upon the course, thereby greatly hindering and endangering the work of the aviators.

If the Vanderbilt offer be accepted, the present field of the Aeronautical Society will continue to be used as a practice ground for the instruction of aviators and the trying out of new machines, and the new and larger course at the Motor Parkway will be reserved for public races run by professional aviators. New York city is the greatest center of activity in the field of aeronautics, and this offer to provide a completely equipped field, will serve at once to promote the interests of the new sport and maintain this city in its logical position as the leading center of aeronautics in this country.

ENGINEERING.

During the month of May, the grand total of excavation at the Panama canal was 2,477,618 cubic yards. The dry excavation by steam shovels amounted to 1,507,654 cubic yards, and the dredges removed slightly less than a million cubic yards in addition to the amount pumped into the Gatun dam by suction dredges.

There is an apparently well-founded rumor that the Cunard Company has at last definitely determined to abandon Queenstown as a port of call in favor of Fishguard. The inevitable agitation in Ireland against this change is destined to failure, for the reason that there is every argument on the ground of saving of time, expense, and general inconvenience, in favor of making the change.

Dr. Paul Heroult is authority for the statement that gases contained in the molten steel are harmless, since they do not produce blowholes. The latter, according to this authority, are the result of disengagement of carbon dioxide, which takes place during solidification as the result of inter-action of carbon and iron peroxide. Hydrogen, nitrogen and other gases are harmless, and are to be found in about the same amount in Bessemer, basic, acid, open-hearth, crucible, and electric steel.

Prospect Park, Brooklyn, after all, is not to be the permanent resting-place of the replica of the "Half Moon," the Hudson-Fulton Celebration Commission having decided to give the little vessel to the Commissioners of the Palisades Interstate Park, in perpetual trust for the people of the State of New York. It is appropriate that the "Half Moon" should be maintained upon the Hudson River, where she will be open to inspection by the public under suitable regulations.

The new liners which are being built for trans-Atlantic service are all of extreme dimensions. Following the lead of the White Star Line, with its "Olympic" and "Titanic," of 60,000 tons each, the Hamburg-American Line has placed an order for a vessel 850 feet in length which, with 48,000 horsepower, is to develop a 21-knot speed. It is rumored also that the Cunard Line will shortly lay down a steamship of 50,000 tons for service in conjunction with the "Mauretania" and "Lusitania."

The particulars of the new 23,000-ton dreadnoughts for the French navy are as follows: Length, 550 feet; beam, 85 feet; draft, 27 feet. The 12-inch guns will be mounted as in the Brazilian "Minas Geraes," there being two gun turrets forward and two aft, on the center line, and one on each beam. The torpedo defense battery will consist of twenty-two 5.5 rapid-fire guns, carried mainly in a central armored battery. The forward 12-inch guns will have a command of between 37 and 38 feet above the water, and the aftermost pair will have a command of about 21½ feet. The speed will be 20 knots, and the bunker capacity 2,700 tons.

The improvements which have been made in the Siberian railroad have made it possible to accelerate the train service, and reduce the time between Moscow and Vladivostok by twenty-four hours. It is now possible to leave London on Monday and reach Yokohama, Japan, on the second Monday following. By taking the fast Canadian-Pacific steamship, which leaves Yokohama on Tuesdays, the tourist, if he so wished, could reach Vancouver in twenty-six days after leaving London; and in thirty-seven days after setting out on his world-encircling trip he would be again in London. This, be it noted, is less than one-half the time taken by Jules Verne's traveler in his trip around the world.

Mr. T. E. Wilson, of San Francisco, referring to the dead water that is dragged immediately behind a vessel of blunt stern, sends us the following interesting facts: Speaking of the towing of log-rafts 300 feet long and 50 feet broad up the Willamette River, Oregon, he writes: "The dead-water or drag immediately behind the raft, which moved at a speed of not over five miles per hour, was considerable, in fact so great an amount of dead water was towed behind the raft that it was our custom, after spending the day some miles below Portland, to run our skiffs into the stream immediately behind the raft, and nose up to the rear log, where we were towed without making fast, thus avoiding the exertion of rowing back to the city."

According to the Railway and Engineering Review that passenger train No. 4 of the San Pedro, Los Angeles & Salt Lake Railroad holds the indisputable record for slow-speed travel. On December 31st it started for Salt Lake City, listed as a "fast train." It was caught by the storm of January 1st a short distance east of Caliente, Nev., which washed out the track before and behind it. On May 17th it arrived at Salt Lake City, 137 days out from Los Angeles. The passengers were transferred by wagons on January 10th; a Pullman porter stayed by his car for a month; and, subsequently, a railroad watchman was the only guard.

AERONAUTICS.

Mr. Armstrong Drexel, a son of Mr. Anthony Drexel, of Philadelphia, attained a height of 1,070 feet at Brockenhurst, England, on June 19th. Mr. Drexel used a Blériot monoplane. This is a new height record for Great Britain and one which has been exceeded little, if any, heretofore by a Blériot machine.

William Hilliard, the automobile racing driver, has been making successful flights at Plum Island, opposite Newburyport, Mass., on his Herring-Burgess biplane. On the 24th ultimo he is reported to have flown about three miles over the island in five minutes at a height of 60 feet. The machine was described in these columns some time ago. It has novel stabilizing fins on top of the upper plane for maintaining the transverse stability.

Capt. Cody, who some time ago became an English citizen in order to compete for a prize, had a bad fall in his huge biplane on the 23rd ultimo at Aldershot. Capsized by a wind gust, the machine is said to have fallen from a height of 100 feet, precipitating Mr. Cody upon the ground and seriously injuring him. The former American perfected his biplane (which is the largest and heaviest flyer of this type in the world) after a long struggle against heavy odds, and it is to be hoped his injuries are not so serious as at first reported.

Not since Santos Dumont flew with his hands off his control levers something over a year ago has any such demonstration of automatic control been given as was made by Lieut. J. W. Dunne at the Isle of Sheppey on May 28th, when he flew for 7 minutes with the British army biplane without touching the control levers. Only when about to alight did he reassume control of the machine. His automatic stability device consists of auxiliary planes arranged to control the balancing planes. Apparently it works satisfactorily. Other forms of automatic stability apparatus consist of the operation of the rudders, etc., by automatically controlled motors (controlled by relays or compressed air), and the gyroscope either as a controller or directly as a resister to the tipping of the machine.

Several daring flights have recently been made abroad over cities. The first of these was made by M. Dubonnet on his Tellier monoplane, when he flew across Paris at an elevation of about 1,000 feet in a half hour's time. Shortly after this Frey, a German aviator, flew across Berlin on a Farman biplane and was promptly fined for so doing, as the German authorities have passed a law against flying above the city. On May 3d Wiencziers flew over Strasburg and circled the tower of the Cathedral in his Antoinette monoplane. The performances of these men are in reality more daring than that of the aviators who have flown over water, as if the machine is forced to alight upon the roofs of buildings or in the city streets, the aviator's life is in jeopardy. On the other hand, if the flight is made at a sufficient height, it is possible to glide to a point of safety before the machine will come down.

The 20-passenger trip of the new Zeppelin airship mentioned on the opposite page was outdone two days later (June 24th) when the vessel carried 32 passengers (ten of whom were women) in a 100-mile trip from Düsseldorf to Essen, Dortmund, and Bochum and back. At one time, while traveling with the wind, the airship is reported to have made a speed of 56½ miles an hour. She passed through a hard shower and forced her way against a strong head wind without difficulty. The passengers were delighted with the new mode of travel, which they found exceedingly comfortable. This latest leviathan of the air is 485 feet long, with a total lifting power of 44,000 pounds. Its three motors total 330 horse-power and drive it at an average speed of between 30 and 35 miles an hour. The Hamburg-American Steamship Company is selling tickets for trips in this new airship at $50 each.

The "Sea Gull," the third successful monoplane of the Austrian Hugo Etrich, is so named because the tips of the wings bend backward similarly to the wings of this soaring bird. Moreover, the rear edges are sufficiently flexible to yield under wind gusts—an idea originally suggested and put into use, we believe, by Herring in America—and as a result the machine has been found to have exceedingly good longitudinal stability. It is provided with a boat-shaped body and bird-like tail, the whole being of exceptionally light construction (310 pounds). The plane has a 46-foot spread and some 320 square feet of supporting surface. So efficient is it that it lifts nearly 5 pounds per square foot and despite a 500-pound power plant (Daimler 4-cylinder automobile motor of 80 horsepower at 1800 R. P. M.), the machine has carried three people. It attains a speed of 52¾ miles an hour. Aviator Illner, since his record-breaking cross-country flight from Wiener-Neustadt to Vienna and return with the Etrich II. monoplane, hopes to fly from Vienna to Buda Pesth in the near future.

SCIENCE.

The Senate has appropriated $50,000 for the purpose of establishing a biological station to study the contagious diseases of fish. Cancer is one of these diseases. A careful study of these diseases in fish may result in assisting the medical profession in alleviating one of the most dreadful of human afflictions.

Six new elements have been discovered by Dr. Auer von Welsbach. Last year Dr. von Welsbach simultaneously with the French scientist Urbain discovered that ytterbium, for thirty years believed to be an element, was divisible. Since 1878 the Viennese savant has added ten elements to those known.

It is reported that the Lehigh Valley Railroad will soon put in service a dining car which is practically germ-proof. The usual ginger-bread carvings, moldings, and hangings will be dispensed with. The woodwork will be of smooth finished mahogany, so that a microbe, according to the superintendent of the road, "would slip off and break its neck."

Some special developments of the Public Weather Service of Germany are described in two articles in the April number of Das Wetter (Berlin). This service, which was organized four years ago, is eminently practical in character, and is distinct from the old meteorological institutes of the several German states, which still maintain their valuable climatological work. W. Peppler, of the weather station at Frankfort-on-the-Main, tells how the meteorological work of the year, which in the warm season is chiefly beneficial to the agriculturist, is rounded out by a snow-reporting service, in winter, for the benefit of the large and growing section of the public devoted to winter sports. Every Wednesday and Saturday, and on the eve of every holiday, during the cold season, a bulletin is issued, based on telegraphic and telephonic reports from a corps of observers, showing the amount and condition of the snow, and the state of the weather, at the winter resorts in the Taunus, Vogelsberg, Rhön, Spessart, and Black Forest. Dr. Polis, in charge of the observatory and weather station at Aix-la-Chapelle, describes a special service organized at that station for the benefit of aeronauts. Pilot balloons are sent up daily at 8 A. M., to ascertain the direction and force of the upper winds. On Fridays and Saturdays a special afternoon weather map is published, based on observations made at 2 P. M. all over Europe, including observations of the upper air currents at the aerological stations, and an afternoon forecast is telegraphed to the aeronautical societies of southern Germany, most of whose ascensions are made on Saturdays and Sundays. A thunderstorm warning service for aeronauts is also maintained, similar to the one organized at Frankfort during the aeronautical exposition of last summer.

A very interesting research has been carried on at the University of Kieff by Prof. Kossogonoff, who has employed the ultramicroscope for the examination of liquids during electrolysis. The beam of light converged upon the liquid had previously traversed a solution of ammonium chloride, which absorbed much of the heat-producing rays. When the liquid was examined through the microscope, with the electric circuit broken, scattered bright points were seen, which in almost all cases, exhibited the peculiar Brownian motion. In a solution of copper, in which the current passed between copper electrodes, these bright points were seen to move in the direction of the electric current. Some of the particles, however, exhibited no tendency to move in any particular direction. Similar phenomena were observed in a solution of silver nitrate, with silver electrodes. In non-electrolytic liquids, such as benzol, neither movements nor bright points were seen. When the current was reversed in an electrolyte, the direction of motion of the bright points was reversed also. When the current was allowed to flow for a few seconds, the number of bright particles between the electrodes increased. The appearance of these particles at first suggested the idea that they were particles of dust, but it was proved by many experiments that they are something very different. On careful examination, similar particles were observed to accumulate at the cathode, where they formed fine arborescent crystals, which must be regarded as products of electrolysis. The strongest argument, however, against the dust hypothesis is furnished by the fact that the particles do not disappear gradually, as would be the case with dust, but that, on the contrary, they steadily increase in number during the flow of the current. When the liquid is placed in a magnetic field the lines of force of which are perpendicular to the direction of the current, the paths of the moving particles are altered in accordance with Ampere's law. Hence, it is inferred that these bright points bear some close relation to the flow of electricity and that they are probably the carriers of electricity, i. e., the ions. This view is confirmed by the discovery that the velocity of the bright points is approximately equal to the velocities of ions, as measured by Kohlrausch.

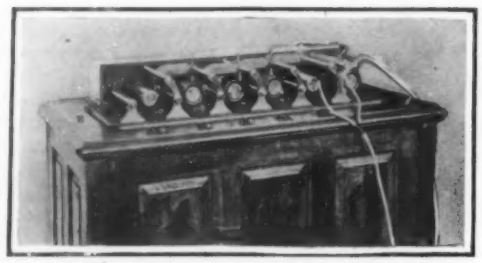
DICTATING LETTERS BY TELEPHONE

In many busy offices, the phonograph has entirely displaced the stenographer as the intermediary between the dictator and the typewriting machine. The time of the typist is thus economized, and the dictation may be recorded when and at any rate desired.

A further improvement has recently been developed. The phonograph has been entirely eliminated from the dictator's office. In its stead a desk telephone is used, and the words spoken into the transmitter are conducted to the typist's room, where they are automatically recorded on one of a battery of wax cylinders, ready to be reproduced and transcribed on the typewriter. Each desk in an office may have its own recording cylinder, so that any number of persons can dictate simultaneously. Thus, instead of having separate phonographs, the apparatus is all centralized in a single multiple recorder, which also includes a reproducer used by the typist in transcribing the dictation on the typewriter. One of the accompanying illustrations shows a recorder cabinet provided with five recorders and one reproducer.

The desk telephone is not furnished with a receiver, as all communication between the dictator and operator regarding the operation of the recorder is carried on by automatic signals. Wherever one wishes to dictate a letter, he picks up the transmitter on his desk and, in doing so, unconsciously grips and depresses a button in the standard of the instrument. This closes the circuit of a magnetic clutch in the recorder cabinet, whereby the drum which carries the wax cylinder operated upon by this particular transmitter is set in motion. The same button closes the circuit of a signal lamp at the top of the telephone standard, and as long as this glows, the dictator is aware that the recorder is operating properly.

The cylinder will take an eight-minute dictation before it needs to be replaced. At any time, if the dictation is interrupted, the cylinder may be stopped by releasing the button on the transmitter. Half a minute before the cylinder is filled, a switch is thrown automatically which extinguishes the signal lamp, giving the dictator warning that he must stop at the end of the next sentence or paragraph. At the same time a buzzer is sounded in the cabinet which notifies the operator that a cylinder must be replaced, and a lamp opposite the cylinder glows and indicates which one needs replacing. As soon as a new cylinder is placed on the drum, and the recorder is ready for further dictation, the fact is signaled to the dictator by the relighting of the lamp on his transmitter. In the meantime, while one or more persons are dictating, the typist may be transcribing the dictation of previously filled cylinders. The reproducing instrument may be controlled by pressing a button with the foot, so that the typist may take the dictation sentence by sentence as desired, and has the instrument under control, while her hands are free for typewriting.



Cabinet with five recorders and one reproducer.

Recorder inverted to show diaphragm and stylus.

Efforts to record the vibration of a telephone receiver on a wax cylinder have heretofore proved unsuccessful. The main difficulty has been to produce a mechanism which would be sufficiently sensitive, and which at the same time would follow the eccentricities of the wax cylinder. This difficulty has now been overcome very cleverly. Pictured in one of the illustrations is a recorder inverted to show the operating mechanism. It comprises a pair of electro-magnets *A*, which act upon an armature of soft iron mounted on a strap of thin metal *B*, which serves as a diaphragm. Instead of connecting the diaphragm directly with the recording stylus, an arm *C* is hinged immediately below it. Fulcrumed in this arm is a lever *D*, which at one end is connected by a link to the diaphragm *B*, and at the other end carries the recording stylus *E*. The arm *C* is provided with a weight at its free end which is sufficient to hold the stylus against the cylinder. Any eccentricity of the wax cylinder is taken up by the motion of the arm *C*, which carries the fulcrum of the lever *D* up and down without interrupting the vibrations communicated from diaphragm *B* to the stylus through the link. The shaft on which the recorder is mounted is hollow, and within it is the screw which feeds the stylus axially along the cylinder. The shaft is slotted to admit a nut which is carried by the recorder. When resetting the recorder, a cam lever is operated which throws this nut out of mesh with the screw, and breaks the circuit of the magnet *A* as well as of the dictator's signal lamp.

The automatic system of signals between the telephone and the cabinet is very complete, and so simple as to be understood by any one. The business man has at his beck and call a mechanical ear, in which he can dictate his letters without the distraction of adjusting or regulating a machine. The device is ready to record his words in or out of office hours. It might be so arranged as to permit him to dictate letters from his home. For long dictation an automatic relay may be used to connect the transmitter with a new cylinder as soon as the first is filled. The dictation may thus be continued without interruption, indefinitely. The instrument might also prove of value to a public typist, who could have a number of offices connected with the recorder cabinet. In hotels also arrangements could be made to have the hotel typist take the dictation of the guests, transmitted by telephone from their own rooms.

AUTOMOBILE ELECTRIC LIGHT PLANT

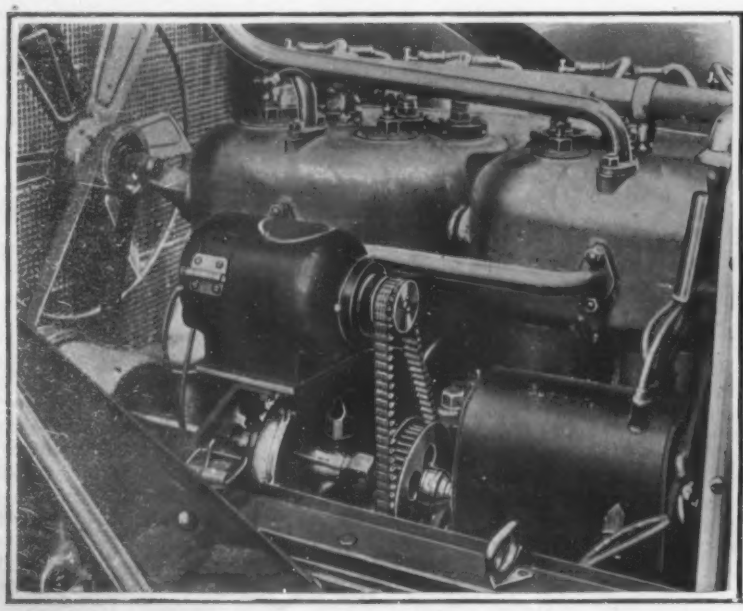
One of the greatest additions to the pleasure and convenience of night motoring is an improved electric lighting system recently perfected. By means of it a greatly increased efficiency for all the lights of the auto is secured, as well as a much safer and more convenient system than has heretofore been furnished by means of gas or oil.

The system in question consists of a small multipolar generator having a positive drive from the engine, and is contained under the same hood. Besides this, a device known as a load regulator and a small storage battery are required.

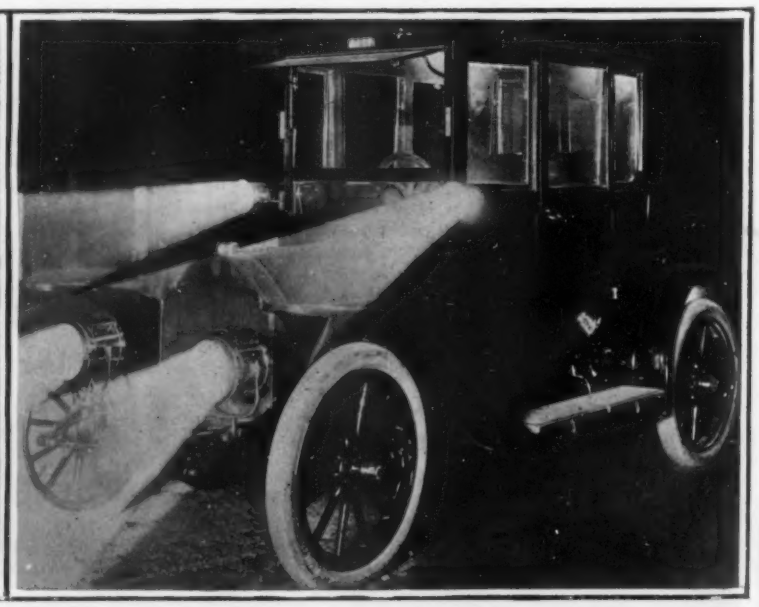
The generator, which runs upon ball bearings, and weighs but twenty-four pounds, is capable of producing the required current, even on a slow speed of the engine, to light all the regular equipment of lamps. It also furnishes the ignition spark for the engine. If running at a high speed or when the engine is being operated free of the machine, the load regulator comes into play, diverting the excess current generated into the storage battery, and thus keeping it at all times fully charged and able to supply the necessary current for the lamps when the machine is standing idle.

It is unnecessary for the chauffeur to leave his seat in the machine, either to light or adjust the lamps, or to ascertain the amount of current being generated by the dynamo or the battery. An instrument located directly in front of him gives all the necessary information.

The lamps used in connection with this system are of an improved pattern. Requiring no air to support combustion, as is the case with gas and oil lamps, they are completely closed, thus excluding dirt, which, in the ordinary lamp, is so undesirable. It is unnecessary in equipping a machine with a generator, however, for the owner to purchase new lamps. Old gas lamps can be refitted with the new electric fixtures if so desired. Tungsten lamps of an improved pattern are used throughout the system, so that the greatest possible amount of light may be secured with the least amount of current. The head lights accommodate twenty-candle-power lamps, which, with the improved reflectors devised for use with them, will project a stream of light more than double the distance of the ordinary gas lamp.



Generator and its operative connections.



The lights in full blast.

AUTOMOBILE ELECTRIC LIGHT PLANT.

AN ELECTRIC TIME RECORDER FOR FLYING MACHINES

BY OUR BERLIN CORRESPONDENT

On a recent occasion, at Johannisthal, near Berlin, an electrically-operated time recorder was used to register the durations of flight of each flying machine with good results.

As this apparatus was installed in the umpire's cabin, was accessible only to a few, and hence, little known, a short description is likely to be of interest to our readers.

A view of the main part of the time-recording apparatus is represented in one of the accompanying engravings. A tape of paper about 30 centimeters (11.81 inches) in width is moved along slowly between two drums by clockwork. A clock with a contact device actuates each second and each minute respectively, one of the two electro-magnets located beneath the edges of the paper tape, thus producing at both edges a continuous series of dots, the intervals between which accurately correspond to a second and a minute respectively. The paper tape moves past some styles, which draw a number of parallel lines.

In addition to the electro-magnets released by the clock, there are a number of other magnets located on the table below the paper tape, their styles being arranged in one line traversing the paper tape.

These electro-magnets are connected both to the umpire's cabin and to the points of observation distributed along the aerodrome where the timekeepers are stationed. Whenever a flyer starts and passes the goal line, the umpire presses a button bearing the number of the flyer, thus actuating simultaneously four electro-magnets of the recording device, so as to produce markings on the corresponding section of the paper. The other points of observation also have push-buttons bearing the number of the flyer. As soon as the timekeeper notes the flyer in his field of view, he presses the corresponding button, and a dot is made on the paper in the particular section. The distance of this dot from the four dots made by the umpire at the start gives the time taken by the flyer in arriving at the first point of observation. The same process is repeated at the next station, and so on, until four dots are again made simultaneously on the goal being passed.

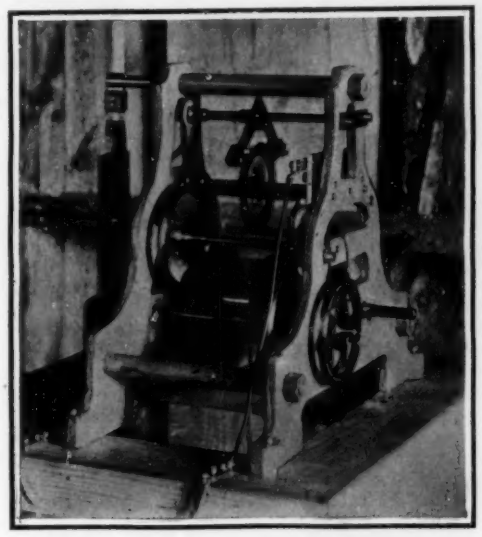
The distance between the last four dots and the first four dots gives the time taken for completing one round. An exact record of the time and speed of the flight is obtained by drawing a zigzag line connecting all the dots. When several flyers are in the air simultaneously, a look at the paper tape suffices to show which flyer flew longest and fastest.

The wire connections between the points of observation and the umpire's cabin are made of iron-armored cable which also ensures a telephone connection between the timekeepers and the operator of the recording device. The telephone exchange is arranged for use in ringing up simultaneously the instruments fitted at the points of observation, thus avoiding any loss of time in giving information as to the flights proposed as well as in case of accidents.

In this manner were recorded all the flights made during the important aviation week, the records being used as a reliable basis for the distribution of prizes and as an irrefutable evidence in cases of dispute.

Messrs. Mix and Genest, who designed and manufactured these apparatus, installed the whole plant, inclusive of the telephone apparatus and cables, within the very short time of five and a half days.

The effect of workmanship on the strength of concrete was tested some time ago at the laboratory of the Technologic Branch of the United States Geological Survey, then situated in St. Louis. Three firms doing concrete work in the city were asked to furnish gangs to mix and place concrete for cubes and test beams. The same materials were supplied to all three gangs, and the cubes and beams were tested under the same conditions. The maximum variations between the test results were about 100 per cent, parallel specimens made by the laboratory's workpeople testing to about the same strength as those of the gang securing the maximum results. With a richer



The electric time recorder clockwork.

mixture the greatest difference in results was about 60 per cent, indicating that an increase in cement tends to cut down discrepancies. The beams were 13 feet long, and designed to fail in compression, to give a true index as to strength.

Weather Forecasts for Aviators.

BY GEN. WM. A. JONES, U. S. ARMY, RETIRED.

The art of flying has reached a stage where a thorough study of the lower currents of the atmosphere becomes imperative, and hence it seems timely for me to state some of the results of considerable personal observation of weather movements made over a period of about fifteen years while engaged in the United States Lighthouse Service along a stretch of the Atlantic coast extending from New York Bay to the Keys of Florida. In this service there are frequent occasions when a successful forecast of what may be expected of the air currents in a given locality to-morrow or the day after is a matter of very great importance. I have observed that "spells of weather" are largely functions of the surface winds and may be assembled in two general classes:

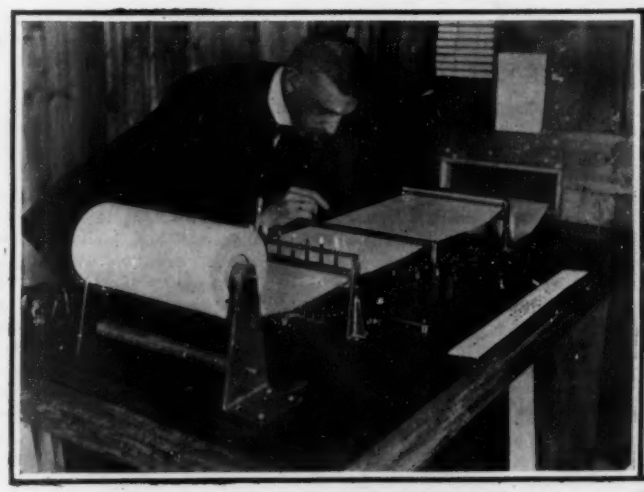
(1) Northerly weather. (2) Southerly weather.

In the former the winds will blow from northerly quarters from the west, veering normally around through the north to the east, and in the latter they will blow from southerly quarters from the east, veering normally through the south to the west. In northerly weather the air is moving in a large body over a considerable extent in longitude, and along each side of it, and sometimes on top of it, will be found similar large bodies of southerly air extending laterally over a considerable extent in longitude. At any particular locality on the earth's surface, during the ordinary fluctuations of the weather, these northerly and southerly moving bodies of air are continually replacing each other. A southerly spell is invariably succeeded by a northerly spell and the change is often very rapid. The mariner is wont to say: "The wind burst out of the northwest." This change is nearly always attended by winds of considerable violence from the northwest or west with a decided drop in the temperature. Under normal conditions these winds will slacken in force in the course of one or two days, and gradually veer around through the north into the east and then be replaced, usually in rather a quiet manner, by southeast winds, which will in a wholly uncertain way veer around through the south into the west to complete the everlasting cycle. While the wind is veering through the southeast and south the change is frequently attended with squalls and thunder storms and rain. The regularity of these movements is doubtless caused by the influence of the earth's rotation upon large masses of air in motion. This regularity of movement is often interrupted and delayed by the injection of cyclonic or rotating masses of air of great horizontal dimensions, which may perhaps be formed in the upper regions of the atmosphere, to descend and be destroyed by friction against the surface of the earth.

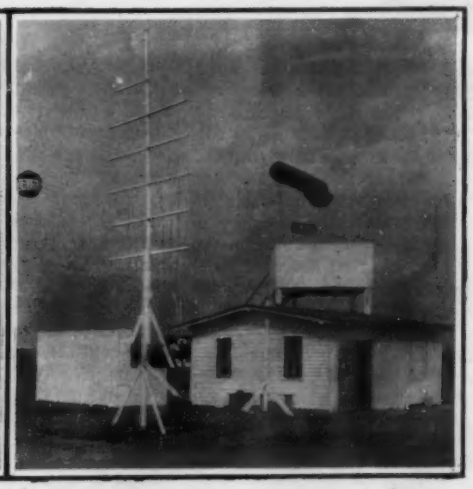
A WEATHER SIGN FOR AVIATORS.

I have said that a southerly spell of weather is invariably replaced with a northerly spell with a blustery prelude of high northwest winds. There are occasional times when the northerly spell does not, at first, succeed in pushing the southerly spell aside, or up on top of itself, and the wind veers backward toward the south and southeast with a usual accompaniment of heavy rainfall. But the normal change will invariably take place within a short space of time and be attended with clear and cooler weather. When it does take place, *on the first, or second, morning thereafter, commencing an hour or two before daybreak, and continuing for several hours thereafter, there will be perfectly calm weather.* Mr. Curtiss probably struck one of these spells when he flew from Albany to New York. And all aviators can use them for practice as well as for long flights. Of course this forecast may not be absolutely precise. The weather and the winds are developed under conditions which are so numerous, and which vary between extremes which extend over such extraordinary periods of time, that we have thus far been unable to gather sufficient precise data to enable forecasts of precision to be made. But I have for many years used this particular forecast in lighthouse work in cases where it was necessary to lay a steam tender alongside off-shore lighthouses, having no wharves nor landing facilities for large vessels, for the purpose of putting up fog bells or transferring heavy machinery. In such cases any motion of the water renders such operations difficult and dangerous. I do not recall that this forecast ever failed. We would get under way so as to arrive at the lighthouse about daybreak. If we did not find the sea calm on the first morning after the northwest blow we never failed to find it so on the second.

An important generalization may here be stated: It is during the months of June, July, August and September, up to the approach of the autumnal equinoctial disturbance, that the best weather for developing the art of flying will always be found. It is during this period, especially in the month of August, that what may be called great barometric calms occur. In this period long spells of moderately quiet weather frequently occur. The gradients between the "Highs" and "Lows" of the daily forecasts of the United States Weather Bureau are then reduced to a minimum for the year.



Main part of electric time recorder. The tape is moved between drums by clockwork.



The umpire's cabin is on the roof of the aerodrome.

AN ELECTRIC TIME RECORDER FOR FLYING MACHINES.

IS 12-INCH ARMOR NECESSARY?

TARGET RESULTS NO CRITERION OF WHAT WILL HAPPEN IN BATTLE

Several years ago the writer visited Sandy Hook proving grounds to inspect one of the most dramatic tests of armor plate that ever was made at that famous place. A 12-inch shell, loaded with high explosive, had been fired against a face-hardened, 12-inch armor plate. It had passed through the plate intact, and, bursting just to the rear of it, had literally torn to ribbons the heavy steel plating representing the interior framing of a battleship, and had blown a large crater in the heavy backing of sand to the rear. Another shell had exploded when half-way through the plate, hurling a considerable portion to the rear, and shattering the plate in every direction. That was a day of triumph for the gun; and the wrecked target, which was a fac-simile of a section of the side and armor of the battleship "Iowa" seemed to have settled once and forever the struggle for supremacy between ship and gun. Everybody who looked at that shattered and twisted mass of steel and timber read the doom of the battleship writ large upon it.

Half a dozen years later came the opportunity to test, in the arena of actual conflict, the apparently verified theories of the artillerist and the proving ground. The stupendous conflict between the fleets of Russia and Japan brought together, in the greatest naval engagements of modern times, two opposing fleets, each of which contained representatives of the most up-to-date types of battleship. Hour after hour through the livelong day and at all the possible fighting ranges, the high-velocity gun hurled its projectiles against the best Harveyized and Krupp armor plate. Time and again the shells reached the enemy on belt, barbette, and turret, with the result that in *not a single instance was penetration effected through these heavily-protected portions of the ships.*

And yet the fact remains that the best ships of the Russian navy, including the latest products of the French naval yards, were either captured, smashed into almost unrecognizable hulks, or sent to the bottom, and all this in spite of the fact that the so-called vitals of the ship, upon which the bulk of the four or five thousand tons of armor had been so freely lavished, remained absolutely intact.

How did it happen?

It was done by the smashing in of the unarmored or lightly-armored ends of the battleships near the water line; by the penetration of the lightly-armored gun decks; by the demolition of the superstructures by high-explosive shell; by the wrecking of navigating bridges, speaking tubes, telephone wires, and, above all, by the practical wiping out of officers and crews.

What is the moral that this result teaches? Surely its lesson is that the four thousand tons of armor had been badly distributed, being massed too heavily for the defense of certain portions of the ship and too lightly for the protection of others.

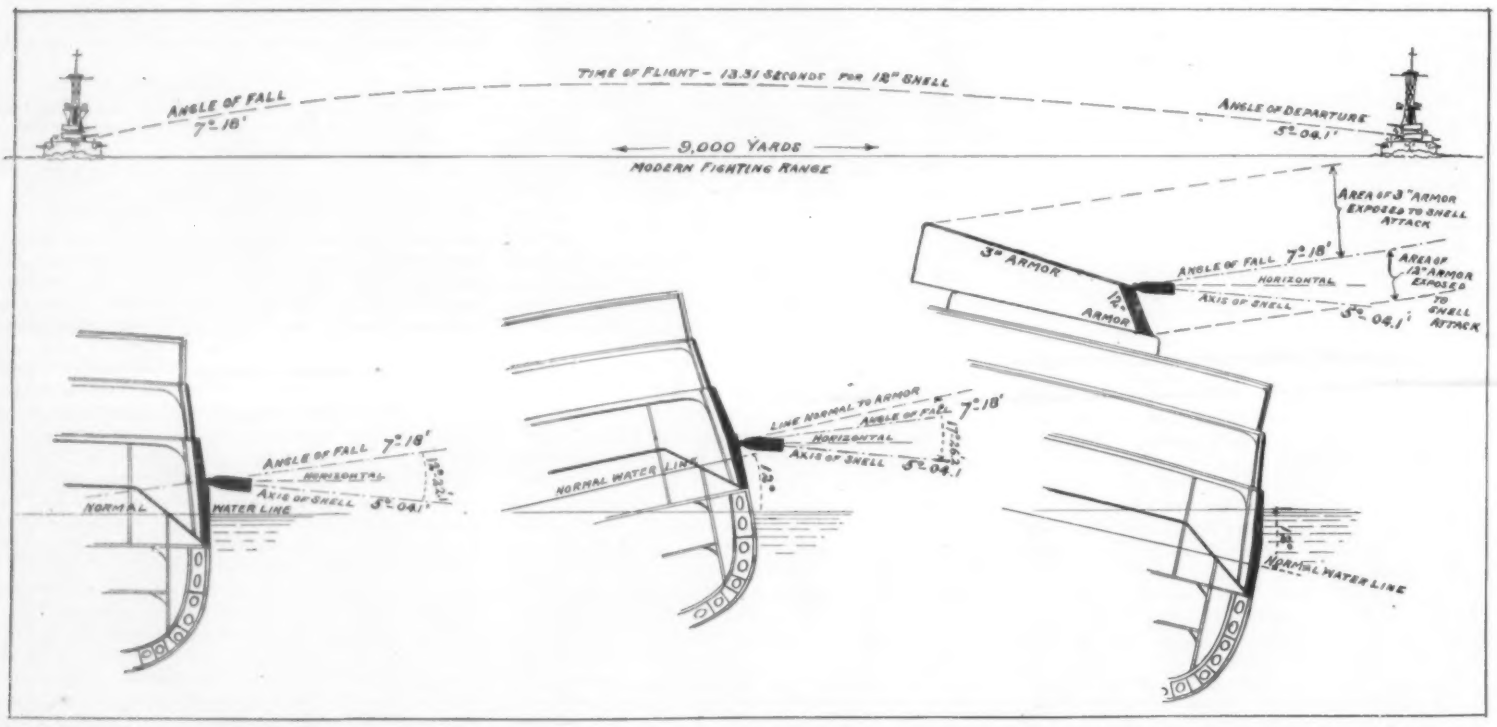
But why, the layman will ask, were not the results of that Sandy Hook proving ground test repeated in the sortie from Port Arthur and in the disaster of the battle of Tsushima Straits? The answer surely is to be found in the fact that *proving ground tests do not represent the conditions which actually obtain in an engagement. The work done by a shell which strikes normal to the proving ground target is no criterion by which to judge its effect when, after a flight of several miles across the water, it falls obliquely against the side or turret armor of a battleship.*

For proof of the above statements we have prepared the accompanying diagram, which illustrates the probable battle conditions. Let us suppose that war has broken out between this country and another with the sudden and explosive violence of a volcano; and that our fleet of dreadnoughts is engaged with the enemy in fighting a broadside engagement at the expected distance of about 9,000 yards. The 12-inch guns have been set at the correct elevation of 5 deg. 04.1 min. corresponding to that range. The shell leaves the gun with its axis inclined upwardly at 5 deg. 04.1 min. to the horizon, and under the action of the rifling it has been set spinning on its longitudinal axis at a speed of several thousand revolutions per minute. It describes a flat parabolic curve, reaching its greatest elevation at a point about half-way between the two ships, and striking the enemy at an angle of fall of 7 deg. 18 min. Because of the gyroscopic effect of its rapid rotation, the axis of the shell does not maintain a position tangential to this curve, but parallel to its original plane of rotation, which, as has been seen, is over 5 deg. 04.1 min. inclined to the horizontal. Consequently, if the enemy's ship is floating on an even keel, when the point of the shell strikes the vertical side armor, its axis is not normal to that armor, but is inclined to it 12 deg. 22.1 min., which is the sum of the shell's angle of departure and its angle of fall. Now, the striking energy of the shell may be considered as concentrated at the center of gravity, which will be at about its mid-length; and consequently, when the point of the projectile brings up against the armor, the energy will not be directed on that point along the axis of the shell, but rather through the axis of gravity on a line parallel to the angle of fall and several inches below the point of impact. Hence it follows that an enormous transverse bending stress will be exerted upon the shell, which will be so great as probably to fracture it before penetration of the armor can be effected.

Should the engagement be fought in a heavy sea (a contingency which the exigencies of strategy may render entirely possible), and should the ships be rolling, say, 12 deg. from the vertical, and should the shell, furthermore, reach the enemy when the vessel was rolling to leeward, the axis of the shell would make an angle of no less than 17 deg. 26.2 min. with a line drawn normal to the armor at the point of impact.

There is, then, little wonder that throughout the whole Japanese war, 12-inch shells failed to get through 12-inch armor.

In this connection, we wish to draw attention to what we have long considered to be a grave element of danger in the present method of armoring the turrets which carry the 12-inch guns. We show a cross-section of one of our latest dreadnoughts, say the "North Dakota," drawn through the ship at the center of a 12-inch turret. These turrets carry 12 inches of inclined armor on the port plate, and 3 inches on the roof. The port plate will probably keep out all projectiles that strike it at the 9,000-yard range; and when the ship is on an even keel, or rolling from the enemy, the shells which just miss the top edge of the port plate will strike such a glancing blow on the roof that they will probably glance off, leaving the roof rather badly dished, of course. But should the vessels be rolling heavily, the defensive conditions are at once greatly changed. Suppose the ship to be inclined 12 deg. toward the enemy. If we draw three parallel, or rather concentric, lines passing respectively through the lower and upper edges of the port armor and through the rear edge of the turret roof, these lines being parallel to the angle of fall of 7 deg. 18 min., we find that the area of 3-inch roof armor exposed to attack is about twice as great as the area of 12-inch armor. Under these conditions an armor-piercing shell would be pretty certain to pass through the roof and burst inside, with the certainty of wiping out the gun crew and the probability of putting at least one of the 12-inch guns permanently out of commission.



The gyroscopic effect of its high speed of rotation (about 7,000 per minute) causes the shell to remain throughout its flight at the inclination (with point elevated) at which it left the gun. Hence it does not strike a true end-on blow. Does not this explain the fact that throughout the long engagements of the Russo-Japanese war the belt and turret armor was never penetrated?

IS 12-INCH ARMOR NECESSARY?

In this connection, it is surely significant that the British armored cruisers of the "Invincible" type (they are really battleships) carry only 7 inches of armor for the water-line protection.

Interesting details are published with regard to trials in rapid coaling and provisioning carried out at Wilhelmshaven last week by the two battleship squadrons of the German fleet and four torpedo-boat flotillas. It appears that the experiments were made under conditions similar to those which might be expected to prevail in war time, and that the work was carried through in record time without any hitch.

Secondly, that either the roof armor be increased to 4½ or 5 inches, or the port plate be carried up to a sufficient height to intercept such shells as, under present conditions, might fall at a penetrative angle upon the turret roof.

First, that at a 9,000-yard range a 9-inch belt would take care of the vitals of the ship, and that the three inches thus rendered available might well be devoted to the thickening of the ends of the ship, and the more ample protection of the sides, conning towers, signal stations, bases of smokestacks, etc.

In view of these facts, the Scientific American would suggest to our naval constructors:

Correspondence.

THE COLDEST REGION OF THE ATMOSPHERE.

To the Editor of the SCIENTIFIC AMERICAN:

Your article under this caption on page 474 of your issue of June 11th, 1910, is a lucid statement of the distribution of temperature at great heights in the atmosphere, but omits the historical references. The fact that, at a definite height, the temperature ceases to fall and an isothermal stratum begins, was discovered almost simultaneously in 1902 by my colleagues, M. Teisserenc de Bort in France and Dr. Assmann in Germany. The first investigation of this stratum in the tropics, however, is not due to the German expedition of 1908 in Africa, as would be inferred from the concluding paragraph of your article, but to a Franco-American expedition sent out jointly by M. Teisserenc de Bort and the writer in 1905-6 to sound the atmosphere in the inter-tropical region of the Atlantic. Temperatures of —112 deg. Fahr. were recorded at nine and a half miles altitude, both north and south of the equator. No trace of the isothermal layer was found at a somewhat greater height.

From observations with sounding balloons which the writer instituted at St. Louis in 1904-7, these being the first in America, he was able to make the general statement that the isothermal stratum, which had an average height of about eight miles in the United States, sank in northern latitudes and rose considerably in the tropics. While it is true that lower temperatures do prevail high above the equator than exist in summer at the same heights in temperate regions, it is also a fact that nearly as low temperatures are found in winter in our own latitudes at lesser heights. This is shown by the temperature of —111 deg. Fahr. recorded by a Blue Hill balloon above St. Louis in January, 1905, at the height of about nine miles.

Hyde Park, Mass. A. LAWRENCE ROTCH.

Death of Dr. Seaman.

Dr. William Henry Seaman, who died June 11th, 1910, at his residence in Washington city, was for many years in the division of chemistry in the United States Patent Office, and for several years recently up to the time of his death had been principal examiner in this important division.

He was born in New York city in 1837, his father and mother being members of the Society of Friends. In 1869 he received an appointment in the Department of Agriculture and removed to Washington, where he attended the law school connected with Columbian College, now George Washington University, graduating in 1872, and being admitted to practise at the bar of the District of Columbia the same year. In June, 1871, he was appointed lecturer in botany in the Medical Department of Howard University, Washington, D. C., and in 1874 he was assigned to the chair of chemistry in the same university, and continued his connection with the university until his resignation a few days before his death. When the dental college in the same university was inaugurated in 1881, he became professor in chemistry therein, and was also lecturer in chemistry and botany in the pharmaceutical college in connection with the same university. In 1883 the honorary degree of M.D. was conferred on him by Howard University.

He was during all this time much interested in microscopy, and gave practical lectures from time to time on the subject. His interest in educational matters was strong at all times, and always in scientific lines, and he was connected with many scientific societies, including the Chemical, Geographic, Biological, and Microscopic societies of Washington, D. C., and was president of the Washington Chemical Society in 1894, and in addition to the foregoing was a member of the Maryland Academy of Sciences, the American Chemical Society, the American Microscopic Society, and other societies for the advancement of science.

From time to time, he contributed articles to the various scientific publications along the lines of his life work.

In 1879 he was appointed assistant examiner in the United States Patent Office, and was promoted from time to time until he was appointed to the position of principal examiner, which he held at the time of his death.

Mr. Albert M. Lewers, who succeeded Dr. William Henry Seaman as principal examiner in charge of the division of chemistry in the United States Patent Office, is a native of Nevada and was the first graduate of the School of Mines of the University of Nevada. He graduated in 1892, and two years later was appointed fourth assistant examiner of the United States Patent Office, and has progressed through the various grades to his present position.

When entering the Patent Office, he was for a period of about eighteen months in the class of packing and storing, and was then transferred to the division of metallurgy, which includes electro-chemistry, and remained in such division up to the time of his present appointment. It is interesting to note that Mr. Lewers is probably the youngest man for many years who has held the position of principal of the chemistry division.

JAMAICA BAY IMPROVEMENTS.

The city of New York holds a commanding position as the leading port on the seaboard of the United States. The statistics from the year 1907 show that out of a total foreign commerce of the United States of $3,581,000,000, $1,613,000,000 represented the foreign trade of the port of New York alone. If we translate this money value into tonnage, we find that no less than 13,000,000 tons of freight passed in or out at the harbor entrance at Sandy Hook in that year, and was handled at the far-reaching lines of docks and warehouses which extend along the shore line of this city. The total frontage of Greater New York upon the water is 444.80 miles. Of this, 125.10 miles is available for shipping, and is divided as follows: 5.33 miles is used by the various steam railroads; 3.61 miles is devoted to foreign steamship service; 3.11 miles to domestic steam service; 23 miles of frontage is owned by the United States government; the various parks of the city have a frontage of 23 miles, and 47.28 miles may be described as miscellaneous.

In spite of the extent of frontage on deep water, that is already equipped with steamship and terminal facilities, so great has been the growth of the business of this port that practically all of the water front on the Hudson and East Rivers, and on New York Bay, that is suitable for dock facilities, has been occupied; and it is recognized that the time is rapidly approaching, if it has not already arrived, when a far-sighted consideration of the needs of the port of New York demands that at least the preliminary steps be now taken to provide for that extensive growth, which the traffic of this port is certain to experience in the near future.

New York City is fortunate in the possession, at Jamaica Bay, of a very extensive stretch of shore line which, at a comparatively moderate cost to the city and the federal government, can be transformed into an extensive deep-water harbor which will afford 150 additional miles of harbor water front. The Bay is surrounded by a wide and level area suitable for the erection of warehouses and the provision of railroad and other terminal facilities. It occupies the major portion of the southeastern quarter of Greater New York; has a water surface of 16,170 acres, or 25¼ square miles, and is surrounded on three sides by low marshes which aggregate 8,500 acres. In addition to this there are 4,200 acres of marsh land lying in the Bay, but isolated from the main body; so that, all told, Jamaica Bay, with its adjacent marsh lands, which in time of excessive flood tides are completely overflowed, covers a territory 28,870 acres in extent. This is equivalent to 45½ square miles.

Early in the present year, the Board of Estimate and Apportionment of the city recommended the Commissioner of Docks to submit plans for the improvement and development of the water front of Jamaica Bay in the Boroughs of Brooklyn and Queens. These improvements will be undertaken with a view of preparing the way for the construction of a new harbor and a complete dock system. This preliminary work is to cost not over $1,000,000.

In the laws of New York for 1909, there is a clause which reads as follows:

"Section 1. To the end that the city of New York may co-operate with the federal government in the creation of a new harbor in and about Jamaica Bay, including the making of channels, basins, slips and other necessary adjuncts, through the excavation of the soil or lands under water, and otherwise, intended for the advancement of the commercial interests of the city, state and nation, there is hereby granted for the purposes specified in this act, to the city of New York, such right, title and interest as the State of New York may have in or to the land under water in Jamaica Bay and Rockaway Inlet and the tributaries thereto. . . . This grant shall become operative upon the United States Government making its first appropriation for the creation of the new harbor mentioned in this act, or upon the city of New York appropriating or setting aside a sum of not less than one million dollars for the same purpose."

In February of last year, Col. D. W. Lockwood of the United States Corps of Engineers, reported to the Chief of Engineers at Washington that the ultimate cost to the United States of the plan for the improvement of the harbor, including a 30-foot entrance channel, a main channel, around the bay, and entrance jetties, will be $7,430,050. He recommended that in order that the city of New York might avail of the co-operation of the State and national governments, an appropriation of $1,000,000 be promptly made, and that the bulkhead and pierhead lines, as described in the reports of the Jamaica Bay Improvement Commission, of December 27th, 1909, be adopted.

In referring the reader to our front page engraving of the Jamaica Bay improvement, we wish to make it clear that it represents not the work that is immediately in prospect, but the whole scheme of improvement as it will appear many years hence when it has been carried to full completion. At the same time, it should be understood that as the work is done it will conform to the lines as laid down in this drawing. The work to be immediately undertaken is as follows: First, there will be constructed a section of bulkhead, sand dike, or rip-rap retaining wall, intended to retain the dredged material which will be taken from the entrance channel or the main interior channel upon which the piers will abut. This dike will be built on the land side, from the entrance of Rockaway Inlet at Barren Island around to Spring Creek Basin, which is the third of the basins shown in the front page drawing. The expenditure for this retaining wall will be $100,000.

It is recommended that an amount not to exceed $150,000 be expended for dredging in the main channel parallel to which the above-mentioned retaining wall will be built, and that the balance of the million-dollar expenditure contemplated by the city be devoted to the acquisition of lands needed for filling purposes.

The pending river and harbor bill before Congress contains a clause calling for the improvement of Jamaica Bay and the appropriation of $250,000 for this purpose.

Coincidently with the development of Jamaica Bay it is planned to construct a waterway connecting it with Flushing Bay and Newtown Creek. Also there is in contemplation the improvement of the waterway between Spuyten Duyvil, Bronx Kills and Flushing Bay by the United States Government; the rectifying and utilizing a Coney Island Creek and Canal, and also the construction of a canal connecting with Great South Bay. A glance at the map shows how the barge traffic of the New York State barge canal could reach Jamaica Bay from the Hudson River by a direct route through the Harlem and East Rivers, and by the proposed canal connecting Flushing Bay with Jamaica Bay.

The proposed channel around the Bay will be ultimately 1,000 feet wide and the distance between the bulkhead and the pierhead line will also be 1,000 feet. This will provide for piers 1,000 feet long, if they be built out normal to the bulkhead, and 1,200 to 1,500 feet long if built, as shown in the illustrations, diagonally. In the future, as the growth of business demands, the cribwork and filling will be extended to the groups of islands in the interior of the bay, which could readily be transformed into docks and warehouse and building sites, of the character represented.

The Current Supplement.

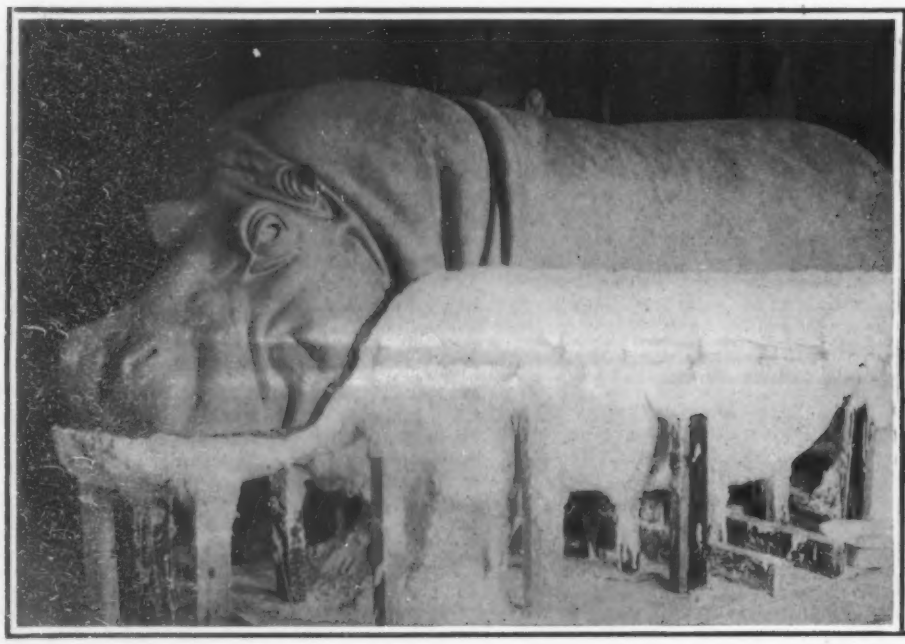
The opening article of the current SUPPLEMENT, No. 1800, deals with the expedition sent out by the Royal Prussian Meteorological Observatory to study the atmospheric conditions in the tropics. Some statistics are published showing the large percentage of increase in central electric light and power stations. Dr. D. T. Macdougal presents a very interesting account of some original researches of his on experimental parasitism in the higher plants. One of the most notable works on the Piræus railway, which has recently been opened in Greece, is the viaduct spanning the Assopos torrent. This wonderful structure is described and illustrated. Prof. J. A. Ewing's critical biography of the late Lord Kelvin's achievements in telegraphy and navigation is concluded. Some striking automobile novelties are presented. The aerial voyage from Europe to America projected by a committee of enthusiastic Germans is described. Prof. R. S. Woodworth writes on the senses of the savage, and shows that they are not nearly as wonderful as they are commonly supposed to be.

When some mine pumps delivering 1,200 gallons per minute against a head of 1,000 feet were first started considerable difficulty was experienced in obtaining quickly a sufficient air cushion in the air vessel of the discharge to prevent an annoying hammer. A remedy was found in an air-charging device. A length of extra heavy pipe, with blind flanges on each end, was placed alongside the pump. Connections were made from the air vessel to the pipe, and also from the column pipe and the air line in the mine. A drain was placed in the lower end of the pipe. To use this device, all connections are at first closed, except that to the air line which charges the pipe with air at a pressure of 90 pounds to 100 pounds. The air connection is then closed, and that to the water column opened. This allows the pressure of the water in the column to compress the air. The column connection is next closed, and that to the air vessel opened. After charging the air vessel the pipe is drained of water, and the operation can then be repeated.

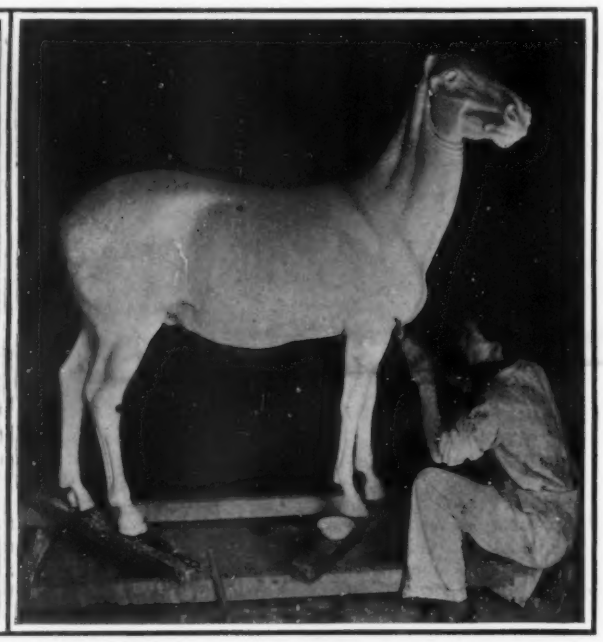
MODELING AFRICAN MAMMALS

BY WALTER L. BEASLEY

The Museum of Natural History, New York, has just commenced active work in the preparation of a very extensive and representative collection of the great mammals of Africa. This noteworthy and comprehensive exhibit, which has been planned by Director Herman C. Bumpus, will afford when completed, in the near future, one of the most impressive and instructive panoramas of the mammal and bird fauna of the Dark Continent to be seen in this country. This valuable collection will present exceptional opportunities to the student and the multitude for a close-range study of the rarest and largest of the fast-disappearing types of the magnificent wild animals from this region, their last and only stronghold on the earth. The collection will be installed in a series of new halls in the west wing, shortly to be built; some however, will fill in missing gaps in present exhibits. From the recent Tjader expedition to the best game localities of British East Africa, made possible through the generosity of Mr. Samuel Thorne, a patron of the Museum, over two hundred medium and large sized animals were secured, representing fifty-six species. Mr. Herbert Lang, the leader of the Museum's Congo expedition, who has been two years in the field, having covered a vast territory rich in game, has secured a great amount of material, including many hundreds of rare and perfect skins and skeletons of mammals and birds. Another special explorer has obtained a fine series of adult and young elephants for the first elephant family group to be mounted in the world. The new plastic handicraft to be employed in modeling and sculpturing the animal forms in clay is well nigh revolutionary in its technique, and the artistic and life-like results, the absolute permanence, produced by plastic methods cannot be approached or equaled by mechanical taxidermy. The plastic art has obtained its most successful development and received its great impetus through its adoption by Director Bumpus in the Museum's Department of Preparation, of which J. D. Figgins is chief. The planning of this large exhibit is in harmony with the bigness, phenomenal growth, and development of the institution. All far-sighted naturalists agree that at the present rate of slaughter, the African game will be killed off more rapidly than it breeds. The commercial and resident hunters, and not the gentleman sportsman and the limited scientific collectors, are the real exterminators. Except in the great game preserves, in the course of a half a dozen decades, more or less, it is thought that the big game of British East Africa is foredoomed to disappear, the largest species first. A feature of the forthcoming installation is that many of the large, showy animals and birds will be represented in a series of picturesque family and habitat groups, arranged in characteristic attitudes. The important and critical task of modeling and sculpturing the commanding forms of the various animals, and the grouping of the same, will be performed by Mr. Frederick Blaschke, a gifted young Hungarian sculptor. By twelve years of study and training in the leading art schools of Europe, Mr. Blaschke is exceptionally equipped in the technique necessary for the interpretation, naturalistic delineation, and sculpturing of animal figures. Four years was spent at the Austrian and Hungarian Academy at Budapest, under Prof. Strobl; four in Berlin at the Academy of Sculpture; two in Paris under Rodin, and two years in the Academy of Drawing at Munich. One of the accompanying illustrations shows the sculptor in a picturesque scene, that of modeling from life a miniature of the fine and intelligent male Grant zebra, which is to form the chief figure in the new zebra group at the New York Zoological Park. Eleven specimens of the most highly prized Grant zebra, *Equus burchelli granti* Winton, were obtained from the type locality (Theca River, upper Tana River). The skins of the zebras were taken off entire, and not in several sections, according to the usual practice. Ten measurements were carefully made in the flesh of all the specimens as a guide to their future mounting. The Grant zebras are noteworthy for their brilliant coloration and variation in the markings. These consist of alternating black and white stripes. The dark stripes vary in color from intense black to dull brown black, the general ground color of the body from clear white to cream white, the nose patch from tan-color to dark brownish black. As the dark stripes usually differ more or less on the two sides of the same animal, a wide range of individual variation is presented. The zebra group will have three figures, the adult male and female and the baby. The central figure will be that of the alert male, standing with uplifted head and ears on the lookout for approaching danger, and the female will be shown grazing nearby, with the young one about ready to dart off at the signal from the parents. As the production of the small working model is the foundation and guide for the finished study, it demands the utmost skill and painstaking care in modeling, for it embodies all the essential points of artistic excellence of the intended group. Instead of depending largely upon photographs, which invariably prove unsatisfactory, giving more or less false perspective and distorted shapes, Mr. Blaschke works direct from life whenever it is possible. With the intelligent and spirited zebra posing within only a few feet, with surprising cleverness and inquisitive interest, the sculptor is able to incorporate in his model the minutest detail of proportion, the characteristic and the natural pose most commonly assumed, and particularly to catch and work in all the delicate gradations of muscular anatomy which are the distinguishing traits and real artistic charm of the finished mounted figure. These opportunities result in an absolutely perfect and ideal representation of the animal. With the completion of a miniature model, active sculpturing and modeling of the large group is commenced. The zebra mount is to be sixteen feet square. With the limb bones, skull, and pelvis put into position, according to the field measurements, on a temporary framework, as a fundamental guide, then the wet clay is applied, and the anatomy and form of the zebra is gradually sculptured and worked up to the finished state. Each figure is modeled, of course, as the animal will be without the skin; this takes its respective place finally on a manikin cast. The skin is temporarily tried on at intervals, and the figure can be immediately altered at those points where improvements are thought necessary. From the finished sculptured form a plaster mold is obtained, from which a thin manikin cast is made, having a lining of burlap introduced, to combine strength and durability with a minimum of weight. The skull and all limb bones are entirely discarded in the manikin, which forms a light, a firm and a precise counterfeit of the natural symmetry and general anatomy of the body. On becoming dry this is given several coats of taxtrine to make it waterproof, when the skin is permanently fitted on. The accompanying picture of the finished male zebra manikin, weighing a little over a hundred pounds, and from one-half to an inch of thickness, quite clearly shows the details of the muscular modeling of the neck, limbs, and other portions of the body. Another of the pictures shows the manner of fitting and trying on the skin, which is adjusted as snugly as a glove over the sculptured form of the zebra manikin.



Obtaining a plaster mold of the sculptured form of the great hippopotamus "Caliph," from which the manikin is to be obtained.



The finished zebra manikin, ready to receive his skin. This method has supplanted taxidermy.

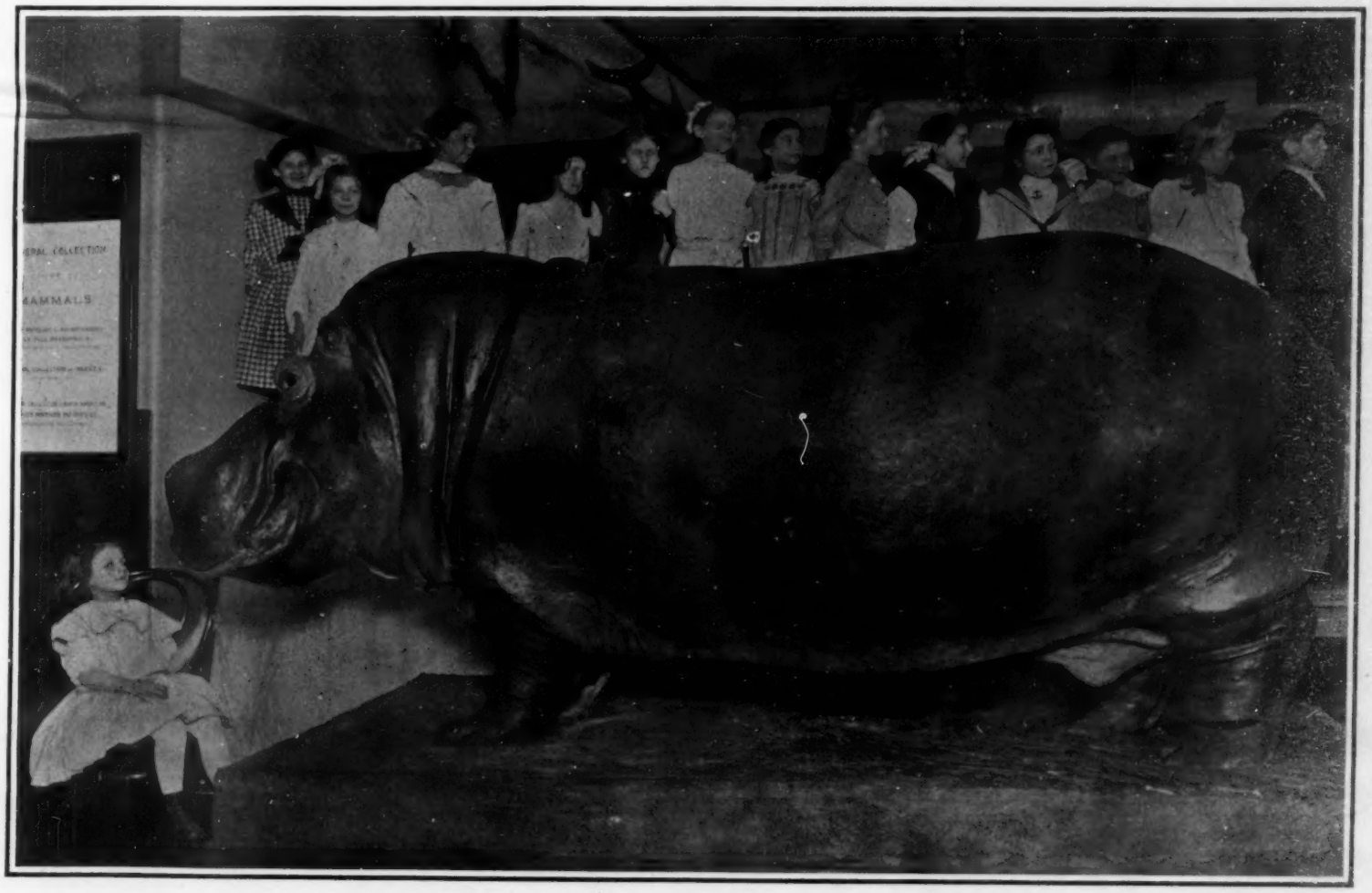
MODELING AFRICAN MAMMALS.

One of the most historic and commanding of African mammals just mounted is "Caliph," the hippopotamus, which for thirty years was the leading center of attraction in the Central Park menagerie. This great beast was the largest and most celebrated hippo in the world, the veritable Goliath of his race, being twelve feet long, fourteen feet in circumference, and weighing four tons when alive. In his special hunt for these creatures on Lake Naivasha, British East Africa, ex-President Roosevelt is reported not to have secured any specimen approaching the extraordinary size of "Caliph." Owing to the great bulk of the hippo and the peculiar difference of texture of the skin of a water-living animal from the land-living types, it required a more careful and different scheme in the manipulation and final fitting on and adjustment of the skin. The working of the huge skin into the numerous deep folds and wrinkles, especially around the massive head, neck, and legs, which are all marvelously brought out on the manikin, was a most difficult and painstaking task. Both the vigorous modeling of the anatomy of the giant animal's form by Mr. Blaschke and the mounting is a remarkable achievement, and is considered one of the foremost examples of plastic taxidermy so far produced. The great skin weighed twelve hundred pounds when first removed from the body, and in some parts was six to eight inches thick. The skin was shaved down to only sixty-eight pounds for final use. This required the service of six men for four days. The skin contained one hundred

square feet of surface, and was from one-quarter to one-half inch in thickness when ready for its final place on the manikin. During the first stages of the building up of the animal's form, the interior resembled a section of an underground tunnel or "subway," as six workmen with electric arc lights could move about with ease in the spacious interior of the great hippo's body. The accompanying illustration shows the giant clay-sculptured form being partly covered with plaster to obtain a mold for the manikin. This had to be made in sections. Afterward the various sections were assembled and plaster applied to the interior surface of the mold, from which the light but firm manikin was secured. This weighed a little over three hundred pounds with the skin on. The writer secured for the pages of the SCIENTIFIC AMERICAN quite a realistic and animated photograph, showing the comparative size of "Caliph," by a group of school children lined up in the rear. The famous old hippo was captured on the Nile when but a year or so old. He was first exhibited in a crude tank in the Cincinnati Zoological Garden, and afterward was obtained for Central Park, where "Miss Murphy" was chosen for his mate. In life he was the most talked of and viewed by more visitors from all over the world than any other animal in captivity. He died in January, 1908, of acute indigestion, and the body was presented to the city by the Department of Parks. "Caliph" was the founder of the greatest hippo dynasty in the world; in fact, five of his offspring are the only one born and bred in captivity that have lived and thrived. Four of these are now in the various zoological gardens of Europe, and one is in the New York Zoological Park, for which three thousand dollars was paid. As the undisputed king of all the hippos, the greatest ever brought into civilization, and whose like probably never will be equaled in the future, the newly resurrected "Caliph" is destined to be of the greatest value to science as a unique and unrivaled natural history specimen.

The sculptor modeling the Grant zebra in New York Zoological Park, as a working guide for a museum family group.

Trying and fitting on the skin of a British East Africa zebra on the manikin.



The mounted "Caliph," the world's greatest hippopotamus, who was 12 feet long and weighed four tons when alive.

MODELING AFRICAN MAMMALS.

The Glasgow Tramway Committee has been experimenting with a new type of car designed principally with the object of protecting the motorman in inclement weather. The matter, states the Electrical Review, is one which has exercised the Corporation for years, the primary difficulty of screening the driving platform being the back draught down the front stairway when the car was in motion. It is believed that this has been obviated by a simple expedient—permanently covering about two-thirds of the stairway and enclosing the upper platform with a sliding door on the roll-top desk principle.

THE HEAVENS IN JULY

BY HENRY NORRIS RUSSELL, PH.D.

LEST we have access to powerful telescopes, the moonless evenings at the beginning of July afford the last opportunity to see Halley's comet that most of us will ever enjoy. Though 150 million miles from us, and 140 million from the sun, at the beginning of the month, it should still be visible with the aid of a field glass, and perhaps faintly to the naked eye. It is then in the southern extremity of Leo in R. A. 10 h. 48 m. and declination 2 deg. 50 min. south—three or four degrees above the intersection of lines drawn through the stars β and ϵ Virginis, and α and ϵ Leonis—all of which are shown on our map—and sets at about 10 p. m. With the telescope it will probably still show some traces of a tail.

After the 7th or 8th the light of the new moon will drown the comet out completely, and a fortnight later, when we can once more see our departing visitor on a dark sky, it will be in all probability too faint to be detected without telescopic aid. By the end of the month (when it sets at 8:30 p. m.) the twilight will interfere with further observations, and nothing more will be seen of it till the end of autumn, when it may be picked up in the morning sky with powerful telescopes, under conditions of brightness resembling those shortly after its rediscovery a year before.

The feature of its close approach to the earth which excited most discussion was undoubtedly the marked curvature of its tail, which caused it to lag so far behind the prolongation of the line joining the sun and comet that it did not graze the earth until more than thirty-six hours after the head had passed between us and the sun.

To be sure, the tail looked straight, but that was because we saw it from a point in or very near the plane of its curvature, like a piece of a hoop seen edgewise.

There was no reason, however, for anyone to be surprised at this behavior, for the tails of comets are usually curved; indeed, they must always be more or less so, as the following considerations will show. The tail consists of fine particles of gas and dust, detached from the head, and repelled by the sun. This repulsion steadily increases the speed with which they are moving away from the sun; but their rate of motion at right angles to the line joining them to the sun is unaltered by the repulsion and remains the same as before.

The line drawn from the sun through the comet, however, sweeps over wider and wider arcs at increasing distances from the sun. If, therefore, we consider a tail particle which has already receded some distance from the head, its cross motion, being at the same rate as that of the head when it left it, will be slower than that of a point on the line just mentioned, at an equal distance from the comet. The tail must, therefore, fall behind this line, and it is clear that the amount by which it lags will be greater, the farther we go from the head.

This may be made clearer by reference to the accompanying diagram. Suppose that the head of a comet, in its motion round the sun, is on three successive days at the points *A*, *B*, *C*. The tail particles given off on the first and second days would have been driven by the sun's repulsion from *B* to *D* in one day and from *A* to *F* (a much longer distance) in two days, if they had started without any motion

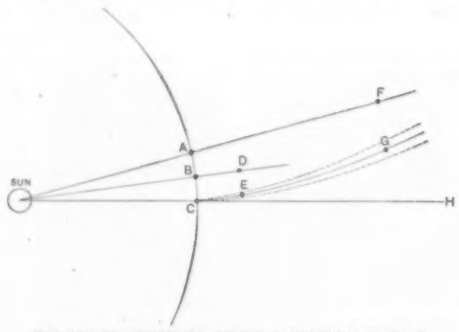
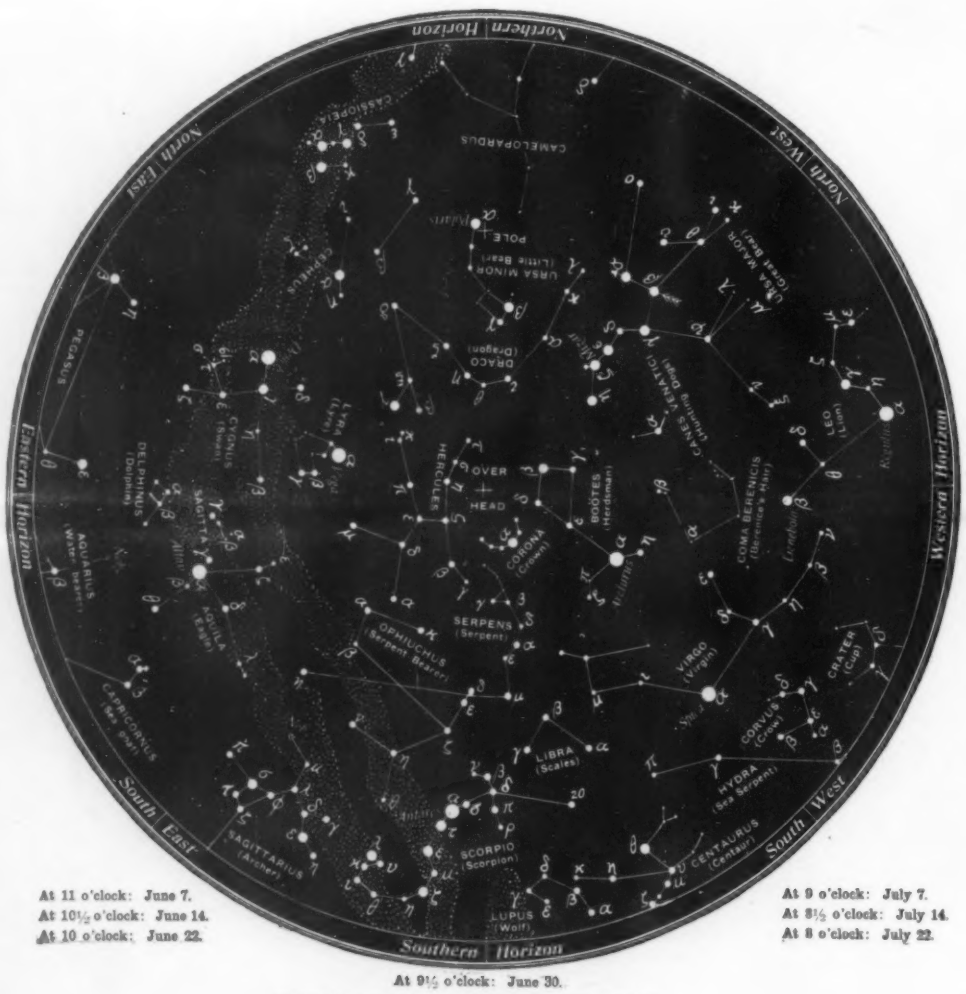


DIAGRAM SHOWING WHY A COMET'S TAIL IS CURVED.

of their own. But since they keep on moving laterally at the same rate as the head when they left it, the particles emitted on the second day will have moved from *D* to *E*, and those sent forth on the first day from *F* to *G*, by the time the third day arrives. The actual line of the comet's tail on that day will be the curve *C*, *E*, *G*, lagging far behind the line *C H*, which extends directly away from the sun.

The smaller the repulsive force, the more sharply curved the tail will be; as will be evident to anyone who will draw a second diagram, in which the comet is supposed to have moved twice as far in the time that a weaker repulsive force drives the particles over the same distances *A F* and *B D*.

As the repulsive force depends on the size of the fine particles composing the tail—which cannot be predicted—it is impossible to tell beforehand how much the tail will be curved. At this return Halley's comet was so placed (while it had any tail to speak of) that we saw the curve edgewise, and could not even estimate the sharpness of its curvature, until its delay in passing us revealed the facts. That there would be some delay was foreseen, but its amount was unexpectedly large, showing that the repulsive force on the tail of this particular comet is relatively feeble.



At 11 o'clock: June 7.
At 10½ o'clock: June 14.
At 10 o'clock: June 22.

At 9 o'clock: July 7.
At 8½ o'clock: July 14.
At 8 o'clock: July 22.

At 9½ o'clock: June 30.

NIGHT SKY: JUNE AND JULY

THE HEAVENS.

Turning to our map, we find that early in the evening, if we look due south, we will see Scorpio, low on the southern horizon, and, next above, Ophiuchus and Serpens. Our initial letter shows how the outlines of the giant and the serpent which he carries are intertwined. He stands with his feet on the Scorpion and his head (marked by the bright star α) near the head of Hercules, who, however, stands in a reversed position, with his feet to the north, on the Dragon.

The serpent's head is well to the northward, near the Northern Crown, while its tail, stretching beyond the giant's body, runs far into the Milky Way.

West and southwest of the zenith is Boötes, and lower is Virgo, whose chief luminary, Spica, shows a clear white light which contrasts finely with the orange-red of Arcturus and the yellow hue (reflected sunlight) of Jupiter, who is close by.

Leo is low in the West, and Ursa Major descending in the northwest, though still pretty high. Draco and Ursa Minor are right above the Pole, and Cassiopeia and Cepheus are coming up to the east.

Due east we find the splendid Vega, more than half way up to the zenith, with Cygnus below, and Aquila, with the brilliant Altair, to the right. Following the galaxy southward, through a region full of splendid clouds and clusters of stars, we end our survey with the little Milk Dipper of Sagittarius.

THE PLANETS.

Mercury is morning star till the 19th, when he passes behind the sun and becomes an evening star. He is unfavorably placed for observation, rising little over an hour before the sun at the beginning of the month, soon vanishing in the dawn, and not reappearing in the evening till July is at an end.

Venus is morning star in Taurus, rising about 2:20 a. m. on the 1st, and 2:40 a. m. on the 31st.

Mars is evening star in Cancer and Leo, setting about 9 p. m. at the beginning of the month, and 8 p. m. at its close.

Jupiter is in Virgo, visible until about 10 p. m. in the middle of July.

Saturn is best seen in the morning, being in quadrature west of the sun on the 30th, when he rises about 11:30 p. m.

Uranus is in opposition on the 16th, and visible all night long. At this time he is in *R*, *A*, 19 h. 40 m. 35 s., Dec. 21 deg. 58 min. south, and moves 10 s. west and 25 s. south per day. This puts him about midway between the bowl of the Milk Dipper and α and β Capricorni. There are no bright stars in the immediate neighborhood to help in finding him, so that a good star map, or a sketch made with a field glass and compared with the sky on successive nights, is necessary to identify him.

Neptune is in conjunction with the sun on the 21st, and is wholly invisible.

The moon is new on the 6th, at 4 p. m., in her first quarter at 3 a. m. on the 14th, full at the same hour on the 22d, and in her last quarter at 4 a. m. on the 29th. She is nearest us on the 3d, farthest away on the 15th, and will be nearest again on the 30th.

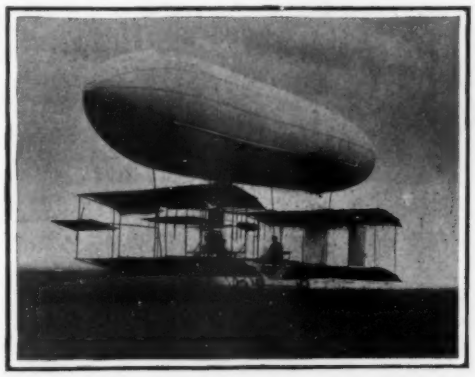
In her circuit of the heavens she passes by Saturn on the 1st, Venus on the 4th, Mercury on the 5th, Neptune on the 6th, Mars on the 8th, Jupiter on the 12th, Uranus on the 21st, and Saturn again on the 29th—the last conjunction being quite close, but invisible because it happens at 6:20 a. m., after the sun has risen.

Princeton University Observatory.

CURIOSITIES OF SCIENCE AND INVENTION

COMBINED AEROPLANE AND DIRIGIBLE BALLOON.

The interesting photograph reproduced herewith shows the latest balloon and aeroplane combination which has been brought out abroad. The aeroplane in this instance consists of two short biplanes arranged in tandem, with the motor placed just at the rear of the forward biplane and the aviator located in front of the rear biplane. Above the aeroplanes



COMBINED AEROPLANE AND DIRIGIBLE BALLOON.

and rigidly attached to their framework is a small cigar-shaped gas bag, which is intended to produce a partial lift of the entire apparatus, thus causing it to rise easily in the air with a very short run over the ground. This machine, which is the invention of M. Cesar, is fitted with a 50 horse-power 4-cylinder Prissi and Berthaud motor. One of its quite novel features is the use of balancing planes in front of the foremost of the main planes, not only for side equilibrium, but also for steering the machine up and down. These two planes are worked together as a horizontal rudder when it is desired to rise or descend. Several more or less successful trials of the machine have been made.

UNIQUE SWIMMING MACHINE.

A swimming machine that can be packed in an ordinary traveling bag and weighs only ten pounds is the invention of a Frenchman of the name of Gar-

A HAND AND FOOT OPERATED SWIMMING MACHINE.

nier. It combines some of the principles of the catamaran, the power boat, and the bicycle, and enables the user to make faster progress through the water than by swimming. It can be used with safety by a person who cannot swim, and makes it possible to travel relatively long distances in the water without exhaustion.

The swimmer lies on his stomach on the connecting tube between the pointed metal floats, and, with his feet in the stirrups, pedals as on a bicycle. There is a keel under the tube, and a fin connecting the driving mechanism with the rear float. These keep the machine on a straight course.

The front float is swiveled and carries a fin which serves as a rudder. A wooden bar is also connected with the propeller by means of suitable gearing, so that by alternately pushing and pulling on this bar, the swimmer can assist his legs in propelling the machine.

A NEWLY DISCOVERED ANIMAL.

There is in the National Zoological Park at Washington a lophiomys, one of the rarest animals in the world and the only one of its kind ever held in captivity. It is one of the collection of African animals sent by the Roosevelt-Smithsonian expedition. The lophiomys is a nocturnal, tree rodent about the size of a cat. It makes its home in the dense forests that flank Mount Kenia and to which few white men have ever penetrated. The present specimen was captured by the Winderobe hunters who inhabit the far interior of Africa around the headwaters of the Nile. Here the forests are dense and dark and man seldom penetrates them. The lophiomys secretes itself by day in the lofty branches, and consequently avoids attracting the attention of the hunter.

Native hunters recently told the British game wardens of the existence of this strange creature and the latter offered a reward for the capture of one alive.

Photo by W. A. DuPuy.

RARE ANIMAL OF ROOSEVELT-SMITHSONIAN COLLECTION. THE ONLY SPECIMEN IN CAPTIVITY.

After the collection at the McMillan ranch had been bestowed on the Smithsonian Institution a lophiomys was brought into camp. Despite the known rarity and value of the creature, it was placed in the American collection.

The lophiomys in appearance more nearly resembles the skunk than any other well-known animal, but is entirely unlike that creature in habits and characteristics. It has spines resembling the porcupine, but these are not stiff enough to serve as a protection. When angered its spines part in two lines down the sides, laying bare the skin far beneath. To date it remains a mystery as to antecedents and kindred.

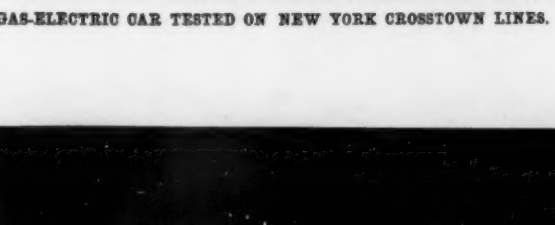
GASOLINE STREET CARS.

Many fields of usefulness are promised for street cars in which gasoline is used to furnish the propelling power. A self-contained car of this kind is of value as a feeder for trolley and other lines, thus developing new country and new business without any great expenditure of capital. It also permits of maintaining night schedules on city electric lines without the necessity of keeping the central station machinery in operation.

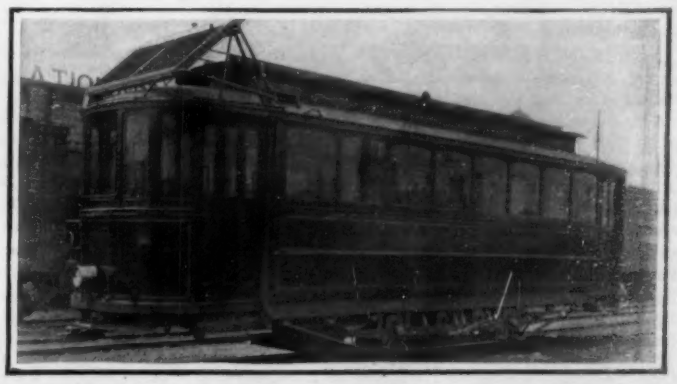
Two cars are here shown. One which has been tested on the crosstown lines of this city may be identified by the radiator at the center of the car roof. It is provided with a direct coupled gasoline engine and a generator with exciter on the same shaft, all completely inclosed and mounted between the axles of the truck and below the car floor. An electric railway motor of standard type is mounted on each axle, and the current for these motors is taken from the generator through a controller at either end of the car.

The cylinders are water-jacketed, circulation being secured on the thermo-syphon principle. The radiation on the roof has a cooling surface of approximately 900 square feet and a capacity, including water-jackets and piping, of about 65 gallons. The gasoline tanks are located under the car seats, and have a capacity of 35 gallons. The engine exhaust is carried to the roof of the car, thus avoiding all odor of burned gases.

The other car, with the inclined radiator at one end of the roof, is operated directly by a 60-horse-power gasoline motor, through a novel friction drive that has proved successful on automobiles. This car recently made a successful test run between Anderson and Lebanon, Ind., a distance of 85 miles. The operating cost per mile was 4.5 cents. The weight of the car is 21,000 pounds.



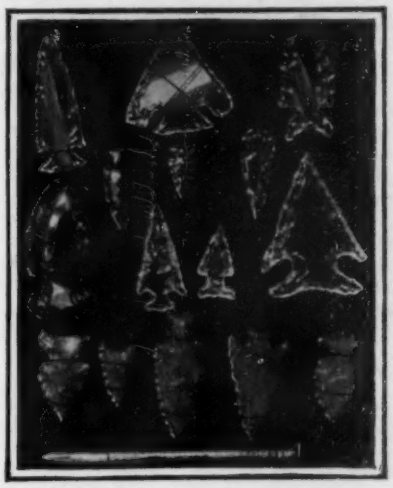
GAS-ELECTRIC CAR TESTED ON NEW YORK CROSSTOWN LINES.



CAR DRIVEN BY GASOLINE MOTOR THROUGH FRICTION GEAR.

HOME-MADE INDIAN ARROWHEADS.

Reproduced herewith is a photograph of a collection of arrowheads which were made, not by an Indian, but by a "paleface" of the twentieth century, and the instrument he used was an ordinary



ARROWHEADS MADE WITH THE NAIL SHOWN AT THE BOTTOM OF THE PHOTOGRAPH

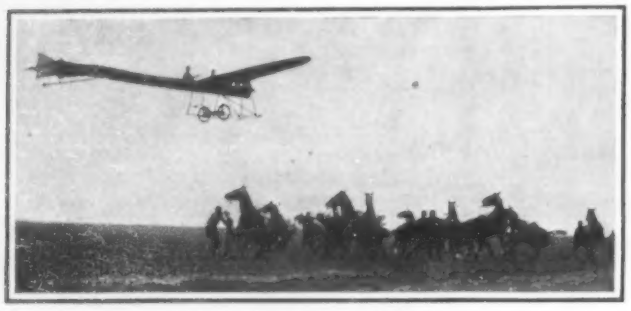
CHIPPING AN ARROWHEAD WITH A NAIL.

nail, filed to a chisel point, as shown at the bottom of the photograph. The arrowheads were made probably in the same way as the Indians made them, no hammer being used. The stone and glass were chipped away by pressing the chisel point against the brittle edge, as shown in the second photograph. Mr. George P. Riggs, to whom we are indebted for the collection of arrowheads, and who discovered the method of chipping them, explains that he first takes a chip out of one side and then turns the arrowhead over, and, resting the point of the nail in the hollow left by the removal of the chip, he presses out a second chip; and thus he proceeds, operating first on one side and then the other, until he produces

the desired shape. The heads in the lower row are made of flint arrowhead chips, which were found, unchipped, in the Ohio valley. Mr. Riggs informs us that he has shaped pieces of flint and glass with a tool of hard wood, such as locust, or a piece of bone, deerhorn, or ivory. These tools prove more satisfactory than a piece of hardened steel, because they will not slip from the glass or flint.

AEROPLANE VERSUS CAVALRY.

The French military recently arranged a test to discover what effect would be produced on a troop of cavalry by the sudden apparition of an aeroplane immediately overhead. The horses were all but stampeded by the sight of the huge birdlike object and the frightful noise of the motor. Since then, regular drills are had, designed to accustom horses to the aeroplane. The accompanying illustration shows how necessary such drills are. The aeroplane is a Hanriot monoplane, and the horses are having their first encounter with a flying man.



AEROPLANE VERSUS CAVALRY.

Brief Notes on Recent Inventions.

There seems to be no end to the various methods of advertising. One of the latest novelties along this line is a rocking chair the arms of which are arranged to display advertisements. The advertisements are printed on a web which is mounted on rollers in the hollow arm of the chair, and are displayed through a glass-covered opening in the upper face of the arm. As the chair is rocked to and fro, a lever in one of the rockers is actuated to turn the rolls and bring new advertisements into view.

Not long ago during a pest of moths, a novel system of catching the insects in large quantities was adopted. It consisted in throwing the beam of a searchlight out of the mouth of a large suction fan and, as the moths gathered, they were sucked into the fan and thus entrapped. A similar idea for household use has occurred to an inventor in Chicago, who has patented an apparatus consisting of a suction fan and an electric light mounted in the inlet tube leading to the fan, while a trap of wire netting is connected to the outlet end of the suction tube. This apparatus is adapted for catching flies, and other insects that are liable to enter the house.

A very original method of testing the quality of a violin has just been patented. It consists in using the violin as a sounder for a gramophone. The stylus or needle of the gramophone is clamped to the bridge of the violin, and the violin is supported in inverted position over a gramophone record. By testing a number of violins with the same record, a customer may be able to judge for himself which of the violins produces the softest and sweetest tones.

A Western inventor has devised a saw, in the handle of which is a receptacle for oil which may be used for lubricating the saw. The oil receptacle is provided with a valve connected with a spring-pressed button which may be operated at will to deliver oil to the blade of the saw.

For the purpose of washing small pieces, such as nursery articles, a wash pail has been invented which not only serves as a boiler, but is also provided with a corrugated scrubbing board at one side. The pail is fitted with a cover to be used when boiling the pieces, and is formed with grooves at one side to receive a fairly wide washboard. The device should be useful in apartment houses, in which tubs are not conveniently located for the washing of small articles.

The annoyance which bathers frequently experience of having water fill the ears may be obviated by the use of an ear plug which has recently been patented by a Los Angeles inventor. The plug consists of a rubber bulb, formed with a sleeve in which a tube is fitted provided at its outer end with a drum. The drum is covered with a waterproof diaphragm of silk and wire gauze. As the bulb is perforated, the plug does not interfere with the hearing. The two ear plugs are secured to the head by means of a strap similar to that used with head telephones.

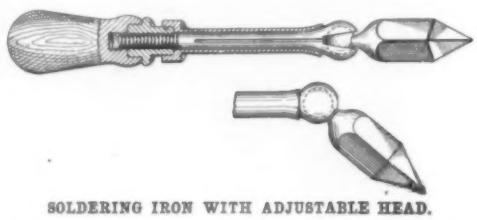
For the purpose of ferrying automobiles across streams, a novel boat has been provided, which is fitted with paddle wheels adapted to be coupled to the driving shaft of the automobile, so that the automobile itself furnishes the power by which the boat is propelled across the stream. The driving wheels of the automobile are lifted off the deck of the boat by means of jacks. The steering gear of the machine is connected to a rudder so that the operator of the machine may pilot the ferryboat wherever he wishes.

In order to preserve the tire of an automobile from puncture, an inventor of this city has devised a wheel in which the tread surface consists of a series of balls, preferably wooden balls, mounted in slots formed in the side plates of the wheel. These balls bear against a pneumatic tire of standard type. The cushioning effect of the tire is thus preserved, while the wear is taken by the balls.

A peculiar muzzle for horses has recently been patented which is designed to protect the nostrils when the horse is running at high speed, so as to break the force of the wind and permit natural breathing of the animal. The device is adapted to be secured to the bridle of the horse, and consists of a frame over which dust- and air-proof fabric is stretched. This is adapted to be mounted at a convenient distance from the animal's nostrils and mouth.

PATENTED ODDITIES.

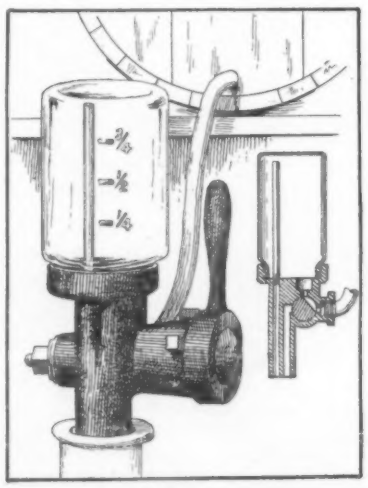
Adjustable Head for Soldering Irons.—It is frequently desirable to be able to change the angle of the head of a soldering iron so as to reach otherwise inaccessible localities. In order to make this adjustment possible, even while the head is hot, an inventor has devised a soldering implement in which



SOLDERING IRON WITH ADJUSTABLE HEAD.

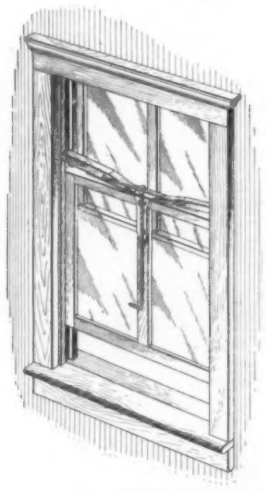
the head is attached to the handle by a ball and socket joint. The stock of the implement is threaded into the handle, and the outer portion, which is split, terminates in a pair of half sockets adapted to receive the ball formed on the soldering head. A sleeve fits over the stock, and is formed with a knurled collar, which may be seized in one hand while the handle is turned with the other, causing the stock to be threaded in or out, so as to clamp or release the head. The head may thus be secured at any angle with respect to the handle.

Measuring Faucet.—A very simple device for drawing off a measured quantity of liquor from a keg is shown in the accompanying engraving. A pipe which leads down from the keg is provided with a two-way cock adapted to open communication either between the pipe and a quart jar supported in inverted position above the valve or between the jar and a discharge spout. The jar is graduated into fractions of a quart, and after the cock has been turned to fill the jar to the desired measure, the valve may be turned to shut off the keg and let the contents of the jar flow out into any desired receptacle. In order to permit the jar to fill, an air vent is provided, consisting of a tube which leads to the top of the jar. As the jar fills, the air flows out through the tube, and while the jar is being emptied, air enters through this tube to take the place of the liquor.



MEASURING FAUCET.

Window Lock.—An inexpensive device has recently been patented which is applicable to any window and serves to hold the upper or lower sash locked at any desired position. A pair of toggle arms mounted on the sash are jammed into the side of the window frame, and prevent the sash from moving. However, anyone may swing the arms out of operative position by drawing down a rod.



DEVICE FOR LOCKING WINDOWS OPEN.

Tea and Coffee Strainer.—In order to catch the drip from a strainer after tea or coffee has been poured through it, an inventor has provided a drip bowl which may be swung under the strainer. The strainer is pivoted in a pair of arms extending upward from the drip bowl. The handle of the device is attached to the bowl and not to the strainer, so that when the handle is turned to one side the strainer will maintain its normal position, while the drip bowl is swung out of the way. When the handle is turned past a certain angle, the arms engage a lip formed on the strainer, so that the strainer will also be tipped, and may be inverted to free it of the dregs or grounds that have collected therein.

STRAINER WITH DRIP BOWL.

Swimming Glove.—In order to increase the effective area of a swimmer's hand, an inventor has provided a glove consisting of an elastic web formed with cots or stalls in which the fingers and thumb may be inserted. The glove is also attached to the wrist by means of a strap. The cots are made of openwork material, so that they will have a tendency to grip and bind the fingers to prevent the glove from slipping off. The outer edge of the web is curved downward, forming a concave or dished surface, which will enable the swimmer to secure a better grip on the water.

SWIMMING GLOVE.

RECENTLY PATENTED INVENTIONS.

Pertaining to Apparel.

HOSE SUPPORTER.—M. FINKELSTEIN, New York, N. Y. In this patent the object of the invention is to provide a new and improved hose supporter, arranged to securely support the hose from the waist of the wearer without the use of an encircling band, thus preventing undue binding of the arteries and insuring free circulation of the blood in the limbs.

DISAPPEARING HOOK.—O. J. WILLIAMS, Buffalo, N. Y. The aim of this inventor is to provide a lacing hook simple in operation and construction, and adapted to extend outwardly from the shoe or the like to which it is attached, when not engaged by the lacing, and which will automatically disappear from its projected position when engaged by the lacing.

Electrical Devices.

TIME-CONTROLLED ELECTRIC SWITCH.—F. M. TOTTINGHAM, New York, N. Y. The more particular purpose here is to provide a switch to perform a mechanical motion, such as the raising of a bucket from a hot water bath after a predetermined lapse of time, this period of time being controllable at will independently of the length of time the clockwork has already been in action.

Of Interest to Farmers.

DEVICE FOR REMOVING OBSTACLES FROM THE THROATS OF CATTLE.—ANTHONY H. KOHNE, care of W. H. Wilcox, Port Townsend, Washington. The device is intended to relieve the suffering of an animal

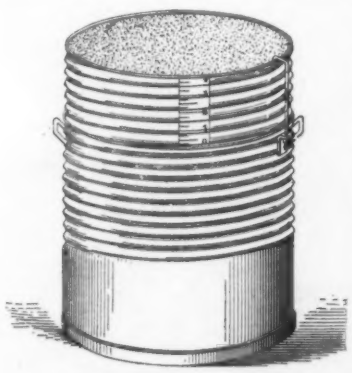
REMOVING OBSTACLE FROM COW'S THROAT.

that has become choked by a potato, apple, or some such obstruction in the throat. It comprises a pair of arms terminating in slightly concave surfaces which are pressed against the throat on opposite sides just below the obstacle and then drawn upward along the esophagus, forcing the obstacle toward the mouth.

GATE.—E. STEBBINGS, Macon, Mo. The gate is for use upon farms and in connection with ordinary roadways, the more particular purpose being to produce a type of gate having certain constructional advantages and adapted when raised by hand into different positions to maintain the position until afterwards disturbed.

INCUBATOR-HEATER.—W. A. MCMAHON, Philadelphia, Pa. In the present invention the improvement contemplates an incubator heater by which only pure air will be delivered to the incubator box or hatching compartment, the air at all times containing the requisite amount of moisture irrespective of the outside atmospheric conditions.

MEASURE.—HERBERT C. HARBRIDGE, Margo, Saskatchewan, Canada. In some sections of the country, grain is sold by the bushel of a certain number of pounds. As the weight per volume of grain sometimes varies considerably,

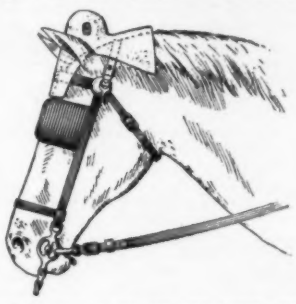


ADJUSTABLE GRAIN MEASURE.

the measure here illustrated has been provided. It consists of two sections, one of which is threaded in the other, and may be adjusted to make a bushel of larger or smaller size, according to the weight of the grain.

Of General Interest.

HORSE-BONNET.—JOHN M. DAVIES, 46 Couch Street, Plattsburg, New York. Mr. Davies has provided a horse-bonnet of smaller dimensions than heretofore, which will not limit the movement of the ears of the horse. Within the bonnet, a drum is suspended provided with a perforated bottom, while a diaphragm is stretched across the upper face of the drum. The diaphragm carries a weight which, owing to its inertia, causes the diaphragm to flex in rhythm to the movement of



HORSE-BONNET WITH AIR-CIRCULATING DRUM.

the horse's head while trotting or walking. This causes the air in the drum to be alternately expelled and drawn in, thus producing a circulation within the bonnet.

GLUE-CONVERTER.—C. M. ZIMMERMAN, Cincinnati, Ohio. This invention refers to an apparatus for converting or melting glue, and the aim is to produce a device by means of which the glue may be melted in a very short period of time, thus avoiding the long continued application of dry heat at high temperature, which destroys the fibrous matter of the glue and diminishes its strength.

GLUE-MELTING APPARATUS.—C. M. ZIMMERMAN, Cincinnati, Ohio. The purpose here is to collect and heat water in the vessel for use in keeping small glue pots hot, to maintain a predetermined water level without loss of steam to prevent water from the steam pipe being blown into the collector or water of condensation running into the collector from the converter, and to provide for the passage of chilled glue from the glue pots into the apparatus and its reheating before dropping into the converter.

PIPE.—J. F. BENGERT, Denver, Colo. The mouthpiece is such as adapted to be removed from the pipe and to serve as either a cigarette or cigar holder, the mouthpiece having an inner socket or holder to receive either an auxiliary stem of the pipe, and an outer socket to abut against that portion of the pipe stem adjacent to the bowl and form a finished joint therewith or receive a cigar.

EQUALIZER TUG ATTACHMENT FOR HARNESS.—H. D. BALCOM, Belfast, N. Y. The aim of this invention is to produce an attachment which will give a desirable freedom of movement of the hame and collar, so that the pressure will not be concentrated at a single point on the hame or collar. In other words, the attachment distributes the pull of the tug on the collar, at the same time permitting flexibility.

FIRE-ESCAPE.—A. O. MÜLLER, Presho, S. D. The inventor's intention is to provide a fire escape for use on dwellings, hotels and other buildings, and arranged to insure a safe and quick escape of persons from the building, the latter being provided for this purpose with permanent poles for engagement of a slide arranged for supporting a person at the time.

PROCESS FOR TREATING ZINKIFEROUS SUBSTANCES.—G. MOJANA, Milan, Italy. This process treats calamin smithsonite, blende, concentrates and tailings, zinc, ashes, namely, the residues of zinc plating industry and all industries where zinc is treated, with the object of forming a soluble compound with the zinc contained in such materials; such compound is then extracted from the remainder of the mass by lixiviation, denatured and electrolyzed to obtain metallic zinc.

Hardware and Tools.

TIGHTENING DEVICE.—C. T. CUNNIUS, Long Branch, N. J. The object here is to provide a device for tightening wires around sectional columns, bales and the like arranged to permit of powerfully drawing the band or wire tight without much physical exertion, and to allow of securely interlocking the ends of the wire or band after the band is drawn tight to the desired degree.

WRENCH.—R. A. MONTGOMERY, Indiana, Pa. This invention has in view a tool presenting a number of internal wrenches of varying size, each being stepped from the adjoining wrench, and the wrenches decreasing in size toward the inner end or point of the tool, the outer edges of the wrenches preferably, though not necessarily, presenting cutting edges, adapting the tool to be used also as a reamer.

BRACKET.—J. KRODER, New York, N. Y. The improvement relates to brackets used for supporting curtain rods, and the object is to provide a bracket, arranged to permit of conveniently placing the rod in position on the bracket or removing it therefrom, to hold the rod securely in place and especially against shifting in the direction of its length.

Heating and Lighting.

LOCK FOR SWING-JOINTS.—B. W. STOUFFER, Pittsburg, Pa. This lock is more especially designed for use in flexible pipe connections, such, for instance, as are employed between a gas fixture and a gas stove, gas burner, gas lamp and the like, and arranged to provide means for locking the swing joint with a view to permit swinging the connected sections into a desired position, one relatively to the other, and to hold them in adjusted position.

Household Utilities.

PORTABLE-REEL GAS-OVEN.—G. B. MEEK, New York, N. Y. The present patent relates particularly to the wall surface of the oven, and this wall structure may or may not be applied to the oven illustrated in Mr. Meek's previous patent. He forms the walls in the present construction with inward and outward chambers, and one of these fills with tile, each tile having one surface thereof so constructed as to facilitate circulation of air.

STOVEPIPE AND THIMBLE.—A. P. MCGUIRK, Davenport, Iowa. An object in this case is to provide a joint for connecting a stove with a chimney or flue, by means of which the joints or connections can be rendered proof against leakage therethrough of smoke or gases of combustion, and which is so constructed that the parts can be easily assembled and taken apart.

WASHPAIL.—G. H. REEVES, New York, N. Y. This pail is for use in boiling and washing out small pieces, such as nursery articles, and more especially intended for apartment houses in which the tubs are not conveniently located. The pail has a flattened side, a washboard slidable over the flattened side, and a cover for the pail adapting the same to be used as a boiler for the pieces preparatory to washing them on the board.

Machines and Mechanical Devices.

WINDMILL.—L. C. MATTHEWS, San Francisco, Cal. The purpose of the invention is to simplify the construction and increase the efficiency of wind engines or mills, and to this end is employed a single sail which is distended in a frame mounted on the horizontal crank shaft of the mill so as to oscillate in a vertical plane and also to rotate horizontally.

BRUSH FOR BOTTLE-WASHING MACHINES.—C. K. VOLCKENING, New York, N. Y. In this instance the invention comprehends a ferrule in which there are a plurality of swinging arms adapted to be moved into abnormal positions, and it is sought to provide improved spring mechanism simple in construction, and not likely to get out of order, for restoring these arms to their normal positions.

TILE-TRIMMING MACHINE.—W. G. TRAUTVETTER, Paterson, N. J. This machine accurately trims a large number of tiles at one time, thereby greatly reducing the labor involved and therefore decreasing the cost of manufacture of the tiles. It may be employed in the manufacture or treatment of other substances where similar shapes are to be formed or finished.

SHEARING-MACHINE.—H. HAUS, Pope Valley, Cal. The purpose of this invention is to provide novel, simple details of construction for a shearing machine, that is also adapted for use as a punching device, a vise, and an anvil, which may be employed for general repair of various farming implements, horse shoes, or leather harness.

Prime Movers and Their Accessories.

FEED-WATER REGULATOR.—C. O. BERGMARK, Chicago, Ill. In this patent the object of the invention is to provide a new and improved feed water regulator more especially designed for use in regulating the flow of the feed water into a boiler or the like, and arranged to maintain water in the boiler at an approximately constant level.

Railways and Their Accessories.

AUTOMATIC SWITCH.—C. W. KAUFMAN, Shenandoah, Pa. This switch is adapted to be operated by a locomotive or car passing along the tracks in either direction, it being also adapted to operate manually. Means provides for drawing the switch rails in one direction, with means to prevent the said movement, which is adapted to be freed by the movement of a locomotive or car along the tracks.

TRUCK-BRAKE.—E. D. HARDING, Montevideo, Minn. In the present instance the invention has reference to truck brakes, and more especially to brakes on tracks used at railway stations, and has for its object to provide means which will automatically operate the brake when the platform man hangs up the tongue of the truck.

Pertaining to Vehicles.

DRAFT-EQUALIZER.—E. J. D. MILLER, Barlow, N. D. In this case, means provide for equalizing the draft between horses hitched tandem, the rear double-tree being free to move laterally and longitudinally relatively to a frame in which a sheave is mounted to rotate, the forward end of frame being bent downward and having an open spiral through which a chain connected to the forward double-tree passes, the chain being disposed over the sheave, and the other terminal being secured to the rear double-tree.

NOTE.—Copies of any of these patents will be furnished by Munn & Co. for ten cents each. Please state the name of the patentee, title of the invention, and date of this paper.

Notes and Queries.

Kindly write queries on separate sheets when writing about other matters, such as patents, subscriptions, books, etc. This will facilitate answering your questions. Be sure and give full name and address on every sheet.

Full hints to correspondents were printed at the head of this column in the issue of June 18th, 1910, or will be sent by mail on request.

(12245) G. G. V. asks: Some of my friends here tell me that the Star of Bethlehem has been visible in this vicinity for the last three or four months, in the early morning. I am rather credulous of this statement, so am writing to get the matter proved. Is it possible they have mistaken the morning star, or the lately arrived comet, for the star in question? I can scarcely believe it could be Halley's comet, as that has only been visible in the early morning during the last ten days or so. A. There is no star known in astronomy as the "Star of Bethlehem." Whatever that portent may have been, it cannot now be identified with any heavenly body at present seen. People have sometimes called the planet Venus when she is the morning star by that name; but as we said above, there is no association whatever between the planet and the heavenly body seen over Judea at the time of Jesus's birth, so far as any astronomer can determine.

(12246) E. W. B. says: Will you kindly tell me where the moon rises? I have been told it rises in the west. A. The rising of the moon is caused by the rotation of the earth upon its axis. The earth turns from west to east, and so the moon rises in the east, as does the sun and all heavenly bodies which we can see at night. The moon goes around the earth in a month from west to east. If it went around in less than twenty-four hours, it would rise in the west. As it does not, there is no doubt that it rises in the east.

(12247) O. A. P. says: Will you favor me with a receipt for coloring white glass? I have several dozen globes that I would like to color red (the glass in them is clear white glass), and if possible for green and blue also, but would prefer the red if I couldn't get the other colors. A. We have no receipts for the preparations of the dyes for coloring glass, and they can be purchased at a very moderate price from dealers in electric supplies in your own city. They are probably made from any good lacquer which will take color from aniline dye, eosin for red, and other dyes of any color desired. Dissolve the dye in alcohol and add to the lacquer.

(12248) A. A. P. asks: 1. Do electric street-car controllers heat up when the car is running under check, and is there any danger from this source, and if so, why? A. The controller of an electric car is heated whenever a current is flowing through it, just as every electric conductor is heated by a current. It is not possible to have an electric current flow without the production of heat. The controller is made so that it can carry its current without overheating, and they rarely burn out nowadays. 2. What are reactance coils? A. A reactance coil is a coil used to control the current in an alternating-current circuit as a rheostat does in a direct-current circuit. It does so both by its resistance in ohms and also by its inductance. You will find this treated in Sloane's "Handy Book of Electricity," which we send for $3 postpaid.

(12249) F. A. asks: Can you throw any light on certain principles involved in the phonograph? As I understand it, the sounds are produced by mechanical means. The minute lines cause the vibration to act, and the lines or cuttings produce the sounds by aid of a diaphragm, and these are concentrated by the horn. This seems simple enough, but how can two or more different instruments or two voices be heard at same time? There must be some peculiarity about the cuttings on the record which is not generally understood. Can you explain it? A. The recording needle of the phonograph is moved by the diaphragm of the transmitter by all the sounds which cause the diaphragm to vibrate, whether a simple tone, one voice, or a full orchestra. The vibration of the needle becomes very complicated when the full orchestra is playing, but all the same the needle is able to trace the curve of the sound vibrations corresponding to the tones of all the instruments, as anyone can hear at the horn of the reproducer. There is nothing different when one voice or a chorus is singing. The needle traces the motion which results from the combined vibrations, and then resolves these motions again for the ear when the stylus traces again over the same indentations. It is remarkable, but there is no peculiarity about the more complicated. The simple and the complex are wrought out in the same manner.

(12250) B. L. asks: 1. What is the chemical action in the electrolytic rectifier described in your issue of August 14th, 1909? Have you any SUPPLEMENTS on this subject? A. In the action of the electrolytic rectifier, the aluminium rods are oxidized at the expense of the sodium phosphate, and so present a

greater resistance to the alternating impulses in one direction than to those in the other. Only one set of impulses are able to get through the valve, as it has been called, and the outgoing current is an unidirectional current, rather than a direct, continuous current, such as is given by a primary battery. You will find articles on the electrolytic rectifier in the SUPPLEMENT Nos. 1478, 1644, 1679, and in the SCIENTIFIC AMERICAN, vol. 97, No. 8. We send these for ten cents each. 2. What is the principle of the electrolytic detector? A. In the electrolytic detector the electrolysis at the point of the fine wire is very intense, and this arrangement proves to be a very delicate receptor of electric waves. 3. What is Wollaston wire as used in electrolytic detectors? A. Wollaston wire is the extremely fine plantinum wire used in the electrolytic detector. It is finer than can be drawn through a drawplate. The wire was probably first made for the eyepieces of telescopes for locating the line of sight. It was made by covering a platinum wire with silver and drawing the composite wire as fine as possible. The silver was then dissolved away in nitric acid, leaving the fine platinum wire, so fine as to be nearly or quite invisible to the unaided eye.

(12251) H. S. asks: Referring to p. 88, SUPPLEMENT No. 173, in the formula for reducing the results of the Prony brake test,

$$H.P. = \frac{(6.28 \times G \times N \times A)}{33{,}000}$$

Will you kindly tell me what is the factor 6.28? A. In the formula for the Prony brake test, the constant 6.28 is simply two times the well-known 3.14, the latter being the ratio of the circumference of a circle to the diameter, or the circumference of a circle one unit in diameter.

(12252) W. S. asks: Would you be so kind as to advise me in regard to the rotary engine? Would it be all right to buy stock in? A. We cannot undertake to advise with regard to the desirability of any corporation stock as an investment. Some of the points to be considered are the character of the article to be manufactured, its cost as compared with the expected selling price, and the existence of a real demand for the article, because of the absence of anything else which will do the work as well. A proposed article may be ingenious, useful, and efficient, and yet there may be other articles which do the same work well enough, or which give less trouble in use, or which are so familiar that people will buy them rather than take chances with the new thing. But more important even than these considerations is the question of the character of the men behind a projected corporation, the ability of these men to retain control, and the ability of the man who will act as general manager and be responsible for making the company pay good dividends to its stockholders. All these questions must be decided by the investor for himself before it is safe for him to invest his money in a projected enterprise.

(12253) G. E. W. asks: A contends that the engineers of to-day could not in any length of time or by any machinery build duplicates of the Pyramids. B contends that our engineers of to-day could. Would you be kind enough to answer this question, as it was agreed to leave it to you? A. There is no doubt that the engineers of to-day could not only duplicate but greatly surpass any of the work done by men of past ages. This perhaps could not be fairly said of the artists of to-day, as compared with the masters of time past; though that is open to argument. The usual controversy with regard to the comparative powers of the men of former days as compared with those of to-day is based on the fact that the machinery and appliances of the present time were not at hand to assist the labors of those who built such monuments as the Pyramids, and it is doubtful whether in the absence of the necessity, the present-day workmen would be able to duplicate such massive work with the comparatively crude tools and equipment of the men who left such records of their ingenuity behind them.

(12254) W. L. S. asks: Is there any way of interposing anything that will act as a non-conductor of magnetism from an electro-magnet? A coil or sheet of copper will act as a shield against alternating current or induction, but what I want is something that will act when the current is continuous. A. The only possible way to shield a space from magnetism is to inclose it with iron. This is the method used with railway motors. They are incased in iron boxes, iron-clad, so called. The iron furnishes an easier path for the magnetic lines than the air or any other material, and hence the magnetic lines pass through the iron and do not come out into the air.

(12255) J. W. L. asks: Does not light pressure offer some resistance to the earth's orbital motion, tending to stop the illuminated side, and in this way cause at least a part of the earth's axial rotation, if not all? This idea of resistance is not generally liked very well, but "facts are stubborn things." A. We do not see how light pressure can affect the rotation of the earth. On the side which is approaching the sun it would tend to retard and on the side which is turning away from the sun it would accelerate the rotation to the same degree. The result would be zero. Light pressure can have no effect upon the orbital motion of the earth to retard it or accelerate it any more than a string can retard a ball to which the string is attached from motion in a circle, or gravity can start or stop a ball swinging like a pendulum.

NEW BOOKS, ETC.

A WHITE PAPER GARDEN. By Sara Andrew Shafer. Chicago: A. C. McClurg & Co., 1910. 12mo.; 292 pp. Price, $2.50 net.

This is indeed a sumptuous book with four beautiful colored plates which show remarkable technical excellence. There are other illustrations scattered through the book, which is beautifully printed and bound. A lover of gardens, shut up in the city, has here fashioned a garden on paper—a garden of the spirit in which every lover of blossom and green may wander any month of the year in any weather and find that spiritual rest, those sentiments and memories, that the garden ever has and ever will stand for and awaken. The book is divided into twelve essays, one on each month of the year, and reflecting in the first place the sentiments of an absent garden lover for her kingdom, it will be read with joy by possessors and exiles alike.

CONCRETE FROM SAND MOLDS. By A. A. Houghton. New York: The Norman W. Henley Publishing Company, 1910. 16mo.; 145 pp.; fully illustrated. Price, $2.

In this little book Mr. Houghton has given a simply worded, thorough description of casting ornamental concrete objects from sand molds. In the rapidly widening use of cement and concrete, the lack of skilled workmen really competent to handle this new and plastic material renders the publication of such a book timely. The instructions given are so clear that any man of reasonable intelligence and skill ought to be able to make sculptural objects if he follows them. The book does not presuppose any preliminary knowledge on the part of the reader. It assumes that the reader is entirely unacquainted with the principles of concrete casting, for which reason it should find favor with those to whom concrete and its many possibilities are new.

AN OUTLINE OF INDIVIDUAL STUDY. By G. E. Partridge, Ph.D., formerly lecturer in Psychology, Clark University. New York: Sturgis & Walton Company, 12mo.; cloth. Price, $1.25 net.

Dr. Partridge has written the first popular book that has come to our notice which may be considered as a scientific guide to the study of character and individuality. It may be said to systematize and to classify from a psychological standpoint those ill-defined standards which every human being uses more or less effectively in judging human nature. Broadly stated, it may be regarded as a practical application of general psychology to the needs of every-day life. The book ought to stimulate practical observation of individuals. If we have one criticism to make, it is that it might have described in more detail the methods to be followed.

THE INTERNATIONAL STUDIO YEAR BOOK OF DECORATIVE ART FOR 1910. London and New York: John Lane Company, 1910. 4to.; 258 pp. Price, $3, net; postage, 35 cents extra.

The International Studio Year Book of Decorative Art is always a very welcome visitor. The volume before us appears in its usual sumptuous attire, the text being printed on an English finish paper, while the illustrations are printed on coated paper. The engravings are particularly well executed, some from architects' drawings, and some from photographs. The color plates are particularly interesting. The British country houses which are illustrated are of the most attractive type. Great attention is also paid to wall decorations, stained glass, and ceramics, as well as metal work. The German architecture and decorations also come in for a liberal share of attention, as do also the decorations in Austria and Hungary. The book will prove invaluable for architects.

THE CENTURY DICTIONARY SUPPLEMENT. Prepared under the Superintendence of Benjamin E. Smith, A.M., L.H.D. New York: The Century Company, 1910. Two volumes, 4to.; pp. 1467 + 92.

More than a score of years ago the making of the Century Dictionary, Cyclopedia, and Atlas was begun. After its successful completion in 1891 it was our privilege and pleasure to give this monumental work a thorough review. The last twenty years have seen such wonderful bounds in science, literature, art, exploration, everything in fact, that the necessity for the two new volumes was very apparent, and a careful and repeated revision to which the earlier books were subjected, would never read new material into the copies of those who purchased the earlier editions. Since the parent work was published a new vocabulary has arisen. Time was when the addition of a word to the language was a matter of some note and comment, and frequently of protest, but in these days the inrush of new words and expressions to explain new facts and new conditions, makes it imperative for those who are well informed to be ever mindful of the voices from laboratory, workshop, and study. Similarly there was a time when the careful insertion of a few scattered items, or a few pages at most, in a reference work seemed all that was reasonably required, but no such makeshift can now dispose of the immense accretion of words, sentences, phrases, and all the new knowledge regarding which accurate information is essential, which is an all-sufficient reason for a new edition. The work has been done in a thoroughly scholarly manner, and the editors have not hesitated to call upon various technical and scientific papers for information. Thus, under "turret" we find that "the vertical section through a turret and barbette for 12-inch guns" is taken from the SCIENTIFIC AMERICAN. No better source of information on this subject can be found than the engraving made from our own careful illustration based on government drawings. Other things are treated in the same way; thus the submarine boat is admirably shown. Seventeen government experts were in charge of various departments of this book. The book is a most sumptuous one and beautifully printed by the De Vinne Press and the illustrations number thousands. The new volumes add hundreds of names, and read like a roll call of the recent great who have won a place in their chosen field of activity. The collaborators of the present work number seventy-nine, twelve of whom were also engaged on the original work. They include such men as Cleveland Abbé, Edward Atlee Barber, Franz Boas, Stewart Culin, Edward S. Dana, Theodore L. De Vinne, Dr. L. O. Howard, Dr. F. R. Hutton, Dr. George F. Kunz, Edward R. Smith, Charles P. Steinmetz, Prof. Charles A. Young, and many others. Too much cannot be said in praise of this monumental work, which should be included in every library no matter how small.

CATHEDRAL CHURCHES OF ENGLAND. By Helen Marshall Pratt. New York: Duffield & Co., 1910. 12mo.; 593 pp. Price, $2.50 net.

This volume deals with the architecture, history, and antiquities of all of the cathedrals of England, together with a bibliography and itinerary and glossary, so as to form a practical handbook for students and travelers. The purpose of the volume is to set forth in a concise and orderly manner the most interesting features historical and architectural of the two and thirty cathedrals of England, and is the result of eight years' study in England and on the Continent. The author intends not only to present anew the array of well-known facts concerning the cathedrals, but to give, so far as possible, some hints of the meaning of each, the reason why it was built at the particular time, and also something of the personality of the bishops, abbots, deans, canons, priors, royalties, and noble men and women whose names are inseparably connected with the fabric, or who sleep within the walls. The work has been well done, and a critical examination of the book leaves little to be desired. The only criticism that can be made is the number of illustrations might be considerably augmented with advantage, as now it is necessary to look up illustrations in some other book.

TWENTIETH CENTURY HANDBOOK FOR STEAM ENGINEERS AND ELECTRICIANS. With Questions and Answers. By Calvin F. Swingle, M.E. Chicago: Frederick J. Drake & Co., 1910. 16mo.; 1481 pp.; leather, full gilt. Price, $3.

If the publishers had attempted to make a luxurious-looking book they have failed, largely on account of the fact that the half-tones are so badly printed. Gilding of edges did not take away from fundamental defects of construction. The book however is a good non-technical treatise on the care and management of steam engines, boilers, and electric machinery, with full instructions in regard to the intelligent management of all classes of steam engines, steam turbines, gas engines, air compressors, and elevators, both electric and hydraulic. The section on electricity is particularly good. An immense mass of material has been crowded into the portly little volume, which is sure to be well received, if only for its popular questions and answers. The book is not all however in the question and answer form, but each section has certain information conveyed in this form.

IN AND OUT OF FLORENCE. A New Introduction to a Well-known City. By Max Vernon. New York: Henry Holt & Co., 1910. 12mo.; 370 pp. Price, $2.50 net.

This is a kind of guide book or introduction to Florence, both for those who actually are coming or have come to it, and for those who can come only in the spirit. It tells something about Florence and the Florentines of to-day as well as about those glorious people of the earlier centuries. Finally, it tells also something of how one may become, with the least trouble and expense and most advantage and interest, temporarily a Florentine. The illustrations are from both drawings and photographs, and are very pertinent to the text. There is an excellent bibliography of books on Florence at the back of the book. The chapters relating to various galleries are particularly interesting, while the information which is conveyed about servants, marketing, and housework is extremely valuable.

INDEX OF INVENTIONS

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New Pack for the Army.

After a year's work of investigation and numerous tests, the War Department is about to change the equipment for the foot soldier of the army.

In many respects the new pack differs greatly from the old, in that it is lighter in weight, more compact, and in many cases the utensils are of a shape to take up less room.

The new equipment will include a poncho, so made that it can be buttoned together to form a sleeping bag. The woolen blanket, which formerly was very heavy, is to be made lighter; a heavy pea-jacket is substituted for the overcoat, and a khaki sweater is provided for wear under the overcoat in very severe weather.

The idea of wearing a heavy pea-jacket will meet with instant favor with members of the foot regiments, for it will give greater freedom to the limbs, at the same time giving just as much warmth as the long overcoat with its flapping skirts.

Aluminium enters largely into the make-up of the new pack. A canteen of bottle shape is to be provided, and over the bottom there is fitted an aluminium cup which takes the place of the present metal cup that dangles from the soldier's belt. To effect a saving in weight, the bayonet scabbard is to be made of canvas instead of leather, and the bayonet hangs in its scabbard on the left-hand side of the shoulder pack.

Each soldier carries half of a shelter tent, which with the poncho and a limited amount of clothing are so disposed on the pack that they may be readily detached as one bundle and thrown into transportation wagons when going into action.

When this bundle is detached, the soldier is left with his rifle, belt, ammunition, and haversack containing two days' rations, canteen, and intrenching tool. In other words, the soldier can in a moment divest himself of all that is not needed in battle and yet retain all that is necessary, including rations for two days.

The new pack, which is to weigh about 48 pounds, is located on the soldier's shoulders in such a manner that it will cause him no discomfort from pressing on nerve centers or on muscles in use, and at the same time leaves his arms and legs entirely free from interference.

Demonstrations were made recently by a full company of infantrymen to test the new pack, and they were required to go through the process of breaking camp and loading one wagon with surplus kits, cooking utensils, extra rations, etc. It was shown with what expedition the soldier could separate himself from that portion of his equipment which is not necessary for active service, and the result was surprising.

In the old pack the soldier was obliged to carry on his shoulder one that weighed about 57 pounds. During the Spanish war the soldier's pack averaged about 55 pounds. The new pack with its new equipment, including the aluminium utensils, weighs about 48 pounds, or about ten pounds saved over the old. The pack of the soldier of the civil war was about 75 pounds in weight, at least that was the average weight when the troops started for the front, but it was about five pounds in weight when they returned.

It is interesting to note the average weight of the pack as used by the different foreign powers for the infantry. Germany, with its magnificently trained army, uses a pack that only weighs about 43 pounds. France uses a pack of 49 pounds; England, 47 pounds; Austria, 56 pounds; Belgium, 59 pounds; Spain, 54 pounds, and Italy a pack weighing about 53 pounds. Russia, with its army of big men, carries an extremely light-weight pack, while the Japs carry a pack weighing 57 pounds.

Another strong recommendation which is being urged is the abolition of the officer's saber. Great reliance is placed

(*Continued on page 18.*)

Classified Advertisements

Advertising in this column is 75 cents a line. No less than four nor more than 10 lines accepted. Count seven words to the line. All orders must be accompanied by a remittance. Further information sent on request.

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Inquiry No. 8987.—Wanted, the manufacturers of the Van Winkle Woods & Sons, and the Weber power motors.

PATENTS FOR SALE.

FOR SALE.—Outright or on royalty, an automatic lock for miners safety lamps. Simple, can not be picked. For particulars address Anson Hall, Johnstown, Pa.

Inquiry No. 9014.—For manufacturers of machinery, supplies, etc., to equip a small plant for the manufacture of iridium-tipped gold nib making for fountain pens.

FOR SALE, U. S. PATENT OR SELLING RIGHTS. Cheap and practical machine for the extraction of juice from raw meats, prescribed by all physicians for nutrition of sick persons. For any further information address, A. Petit, 38 Boulevard des Brotteaux, Lyon, France.

Inquiry No. 9016.—Wanted, machinery necessary for an installation of a plant for refining salt by a modification of the Bessemer process.

FOR SALE or on royalty, Pat. No. 986,094, on shoe springs. In line of sporting articles resembling roller skates. H. G. Backermann, P. O. Box 15, Westoff, Tex.

Inquiry No. 9029.—Wanted, catalogues and all information on machinery for braiding straw in manufacturing straw hats.

HELP WANTED.

WANTED.—Drop forge superintendent who can show a successful record, can obtain position with company in Pennsylvania, who will pay good salary to the man who can produce results; the man must be able to design dies, plan equipment, direct die and forge room foreman. In reply give references, age, and salary expected. Superintendent, Box 773, N. Y.

Inquiry No. 9038.—Wanted, the address of the Chipman Electric Purifying Co.

WANTED.

WANTED.—The address of firms who will manufacture celluloid or aluminum patented articles under contract; also firms who will supply bristles for the manufacture of tooth brushes. A. B. Coffin, Apache, Okla.

Inquiry No. 9060.—Wanted to buy machinery to manufacture seed corn racks.

LISTS OF MANUFACTURERS.

COMPLETE LISTS of manufacturers in all lines supplied at short notice at moderate rates. Small and special lists compiled to order at various prices. Estimates should be obtained in advance. Address Munn & Co., Inc., List Department, Box 773, New York.

Inquiry No. 9075.—Wanted, to buy small weather vanes, such as can be used as ornaments on lightning rod tops. Aluminum preferred.

SALE AND EXCHANGE.

A LIST OF 1,500 mining and consulting engineers on cards. A very valuable list for circularizing, etc. Price $15.00. Address Munn & Co., Inc., List Department, Box 773, New York.

Inquiry No. 9076.—Wanted, the address of parties in Canada who could make a safety razor.

Inquiry No. 9078.—Wanted, the address of manufacturers of sewer pipe, made of fiber and asphaltum, suitable for laboratory use.

Inquiry No. 9080.—Wanted the address of parties manufacturing paste-making machinery.

Inquiry No. 9083.—Wanted, the address of firms manufacturing small beer brewing plants, from 75 to 100 gallons a day.

Inquiry No. 9094.—Wanted address of The Thomas Arithometer Company, also Burkhart Arithometer Company.

Inquiry No. 9096.—Wanted, the address of manufacturers of spiral welded pipes, possessing great strength.

Inquiry No. 9097.—Wanted, address of makers of impulse water wheels.

Inquiry No. 9099.—Wanted, address of manufacturers of machinery for making wire cables.

Inquiry No. 9107.—Wanted, addresses of manufacturers of small emery files (pieces of emery in the shape of a file).

Inquiry No. 9109.—Wanted addresses of the manufacturers of the Dion Desk Clock.

Inquiry No. 9113.—Wanted name and address of the manufacturers of the Russell Patent Automatic Ink Well.

Inquiry No. 9115.—Wanted a machine for making pen nibs, similar to Wm. Mitchell's G. & J. nibs and Waverly nibs.

Inquiry No. 9118.—Wanted, a muffler for a gasoline engine, built upon the principle of the Maxim silencer, recently brought out for use on rifles.

Inquiry No. 9120.—Wanted, the address of the Olent Fuel Feeder Co.

Inquiry No. 9124.—Wanted, name and address of a company in Germany making a machine to manufacture a cement and asbestos shingle and building lumber.

Inquiry No. 9134.—Wanted, a small hydraulic motor, capable of giving about one horse power, with a water power of 35 lbs. per square inch.

Inquiry No. 9135.—Wanted, name and address of manufacturers of the Parshall Compressed Air Ice Machine.

Inquiry No. 9136.—Wanted, the name and address of a skunk raising farm.

Inquiry No. 9137.—Wanted, a device that will braid leather strips for horse whips.

Inquiry No. 9138.—Wanted, the address of manufacturers of machines capable of forming a number (15 or more) of pieces of paste about 35 mm. x 32 mm. x 6 mm., made of lead oxide and sulphuric acid, and placing them into a frame having a separate compartment for each piece, the space between each piece and the next being all round 4 mm. The process could be somewhat similar to biscuit making.

Inquiry No. 9139.—Wanted, the name and address of some manufacturer of a coffee mill run by water motor.

Inquiry No. 9140.—Wanted, manufacturers of disc records for gramaphones that use a sapphire point instead of a steel needle.

Inquiry No. 9143.—Wanted, name and address of the manufacturers of an air mattress.

Inquiry No. 9144.—Wanted, manufacturers of machinery for making soda water tubes, commonly known as straws.

Inquiry No. 9145.—Wanted, to buy machinery to load blasting caps or detonators.

Inquiry No. 9149.—Wanted, manufacturers of machinery for roasting coffee for small and large industries.

Inquiry No. 9150.—Wanted, manufacturers of machinery for the manufacture of French heels for ladies' shoes.

Inquiry No. 9152.—Wanted, the address of the Graham Safety Lamp Filler and Ventilator.

Inquiry No. 9153.—Wanted, name and address of manufacturers of a knotless clothes line.

Inquiry No. 9155.—Wanted, the address of manufacturers of an electric milking machine.

Inquiry No. 9157.—Wanted, manufacturers of peanut shelling and cleaning machinery.

Inquiry No. 9161.—Wanted, a machine that will grind oranges, pulp and skin into a smooth liquid or cream.

Inquiry No. 9162.—Wanted, addresses of shirt makers in Manhattan, who will make a few shirts of special design.

Inquiry No. 9163.—Wanted, manufacturers of a cradle worked by clock work.

Inquiry No. 9166.—Wanted, the address of O. Schurmann Street Sweeper and C. H. Butler Contracting Co.

Inquiry No. 9167.—Wanted, the address of the German Quartz Co.

Inquiry No. 9168.—Wanted, the name of manufacturer making the Morse Eureka Spring Terminal, sometimes called spring clip.

Inquiry No. 9169.—Wanted, the address of the manufacturers of the Hornsby Akroid 85 H. P. Gas Engine.

Inquiry No. 9170.—Wanted, manufacturers of a movable apparatus for the distillation of wood stumps.

Inquiry No. 9171.—Wanted, to buy puzzles for a mail order house.

Inquiry No. 9172.—Wanted, the address of the Arnold Vacuum or Suction Cleaner.

Inquiry No. 9173.—Wanted, manufacturers of machinery for removing fibre (coir) from cocoanut husks.

Inquiry No. 9174.—Wanted, improved fabric suitable for airships. Lightness and breaking strain must be exceptional.

Inquiry No. 9175.—Wanted, manufacturers of a machine called Beiasco or Biasco, used in the manufacture of ostrich feathers.

(*Continued from page 17.*)

upon the pistol as the weapon for the officer. For additional comfort of the soldier while in camp soft leather slippers are urged for use to rest the soldier's feet from the stiffer shoes used on the march.

In all of these tests the main idea has been to lessen the weight of the pack, add comfort to the soldier, and to look out for his welfare at all times.

The Calorizer.

Demonstrations were recently carried out in London with a new method of overcoming the smoke question, as represented by the "Calorizer," the invention of Mr. Sherard Cowper Coles, the well-known English scientist. The appliance is of very simple design, requiring no steam jets, mechanical apparatus, or special grates, and there is no interference with the ordinary conditions prevailing in the stokehold. The invention comprises a number of quadrants of a special material which possesses in a very high degree the capability of absorbing and transmitting heat. These are so arranged as to form a kind of combustion chamber immediately behind the fire bridge, with the result that a mean temperature considerably above that required for the complete combustion of all smoky products is maintained, even when the furnace has been temporarily cooled down by the addition of fresh fuel. The opening of the device at its flue end is calculated to give so much more space than the space above the furnace bridge as secures the best effect from the expanding gases without reduction of draught.

The complete combustion thus obtained, combined in some cases with an ingenious automatic regulation of the air required, forms the basis of the economy secured, which varies from 8 to 12 per cent for the same fuel. The furnace used in the demonstrations was equipped with provisions for taking simultaneous pyrometer readings at critical position, and the effluent gases were continuously analyzed by means of a special instrument. The results shown were highly satisfactory, the furnace being charged with three times the usual amount of refuse slack coal without showing the slightest trace of smoke at the chimney stack, the mean record at the same time showing as high an efficiency as 13 to 15 per cent CO_2. The arrangement and apparatus is such that no smoke or unburnt gases can escape complete combustion. The maintenance of a regular temperature in the boiler flue behind the calorizer chamber minimizes the varying strain on boiler plates. The demonstration served to emphasize the efficiency of the invention, which is simple and inexpensive, and already over twenty furnaces have been equipped therewith, while a number of marine and locomotive installations are at present in hand.

Gambrel, F. Knaust	962,358
Game device, base ball, J. J. Fitzsimmons	961,851
Garment and collar fastener, A. A. Reeside	962,242
Garment hanger and protector, R. Sahlin	961,803
Garment rack, H. R. Kuersten	962,227
Gas and smoke consuming attachment, combined, F. Shmonsky	961,810
Gas compressor, Emerson & Bishop	962,203
Gas cut-off, J. F. Wells	962,280
Gas cut-off, automatic, J. H. Skillcorn	961,904
Gas fixture attachment, U. K. Herfurth	961,959
Gas ignition and control, automatic, L. G. Bartlett	962,113
Gas retort furnace, E. L. Riehs	962,051
Gas tanks, packing for acetylene, S. Dickson	962,199
Gases, process and apparatus for utilising the energy of waste, Weise & Rieche	962,108
Gem grinder and polisher, F. F. Van Eps	962,274
Gem mounting, J. J. Buser	962,305
Gold, refining, H. Wohlwill	961,924
Governor, F. L. Nichols	962,163
Governors, speed ranger for, J. W. Kleinhan	961,865
Grader and smoother, road, H. C. Barnett	962,290
Grader, road, S. A. Stone	962,267
Grading machine, road, P. J. Jewett	962,354
Grain bearing straw, feeder for, S. B. McComb	962,238
Grain conveyer, C. J. Hartley	961,958
Grain elevator and dump, F. Kral	961,970
Grain loading machine, J. R. Braden	962,194
Graphophone repeating attachment, C. W. Claud	962,315
Grappling device, H. W. Erickson	961,761
Grinding machine, C. Hayes, Jr.	961,774
Grinding machine, cutlery, C. L. Joy	961,864
Gun, air, G. E. Heckman	962,217
Guns, spade for portable recoil, N. Koch	962,032
Hair tonic, vegetable, J. G. Burgess	961,840
Hame fastener, Caswell & Schofield	961,935
Hammock, baby, I. E. Palmer	962,092
Hammock support, O. P. Ward	962,181
Harness attachment, C. J. Johnson	961,967
Harvester butting atttachment, F. O. Kullander	961,868
Harvester headers, elevator hood for, T. O. Marston	962,232
Hat planing machine, S. H. Fairchild	962,012
Hay loader, J. Dain	961,757
Hides or skins, machine for treating, W. Evans	962,205
Hinge, double acting spring, J. A. Fischer	962,330
Hinge for screens, separable, E. R. Bumpus	961,751
Hitching attachment, wheeled vehicle, Lowry & Walling	961,976
Hitching device, H. M. Reiter	962,243
Hoe, W. J. Allin	961,748
Hoe, garden, A. Sheldon	962,392
Horse detacher, J. E. Drew	961,941
Horseshoe, H. H. Peirce	962,165
Horseshoe calk, C. M. DeJany	961,759
Horseshoe calk, B. F. Wharton	962,282
Hose cleaning apparatus, G. Hoffmann	961,858
Hub, variable speed coasting and braking, A. F. Rockwell	962,245
Hydrant and hose cut-off valve, F. S. Seagrave	961,901
Ice harvester, F. E. Laverty	961,781
Ice making machine, T. H. Ray	962,241
Ice, manufacture of, A. H. Buckley	961,839
Incandescent mantles, container for, H. C. Plimpton	962,384
Indicator operating means, G. N. Saegmuller	961,898
Inflammable solutions, storing, C. Martini	962,036
Ingot mold, E. Gathmann	961,854
Initiation apparatus, E. De Moulin	961,847
Ink well, V. L. Littig	961,972
Internal combustion engine, G. J. Altham	962,110
Internal combustion engine, F. E. Dayes	962,131
Iron ores and the like for smelting in blast furnaces and use in open hearth furnaces, apparatus and process for preparing pulverous, S. Cornell	962,006
Jack, W. B. Templeton	961,909, 961,910
Journal bearing, adjustable, B. J. Carter	962,124
Journal bearings, adjustable sleeve for, C. I. Shirley	962,059
Journal box, C. L. Owen	961,793
Journal box brass, J. M. Rohling	962,166
Knitting machine, circular, A. N. Ames	962,292
Knitting machine, circular fashioning, A. N. Ames	962,291
Knockdown elevator, C. O. Liljeros	961,782
Lace hook, E. A. Engstrom	962,326
Lamp socket cover and shade holder, electric, G. W. Cassidy	962,076
Lamp sockets, strain relief for, F. A. Swan	962,063
Lamp, vapor burning, H. A. Barr	962,296
Lamps and lanterns, burner fastening for, C. L. Betts	962,115
Land roller, W. R. Canaday	962,311
Lantern, tubular, C. Bergener	962,114
Lantern, tubular, C. F. Erb	962,135
Lathe, semi-automatic turret, M. H. Blancke	962,060
Leaf holder, loose, J. Willy	961,923
Leather boarding device, A. M. Marx	962,157
Leather folding machine, R. H. Lufkin	962,034
Lifting jack, C. A. Paisley	961,986
Lifting jack, multiple, A. H. Schole	961,899
Lighting system, wireless, E. B. Tustin	961,914
Line casting machine, J. R. Rogers	961,798, 961,799
Lock, R. Adams	961,996
Lock, H. G. Voight	962,276
Lock stop protector, G. N. Mason	961,979
Locks or burglar alarm systems, time controller for electric time, Williams & Huhn	961,922
Locking device, W. H. Caslow	961,753
Locomotive ash pan, W. W. Sykes	962,269
Loom for manufacturing terry fabrics, G. Kratky	961,806
Loom for weaving double-pile fabrics, G. Zimmermann	962,286
Looms, lay for narrow ware, W. Wattle	962,183
Magnesia granulating machine, U. Di Marco	961,848
Mail box, Rosenberg & Clark	961,897
Mail box, G. Westelin	962,281
Mail chute, A. K. Smith	961,813
Mail discharging apparatus, J. R. England	961,943
Mailing card, private, W. J. Wooldridge	961,829
Manometer, indicating, integrating, and recording, F. N. Connet	962,317
Mat, E. Bouchard	961,929
Match box, pocket, J. E. & V. J. Lowdermilk	961,783
Match stand and cigar cutter, combined, J. H. Astruck	961,927
Mattes, wet treatment of, J. T. Carrick	961,934
Mechanical movements, controlling device for, C. H. Carter	961,842
Metal bars, machine for cutting, H. H. Jensen	962,085
Metallurgical furnace, R. Z. de Ferranti	962,013
Milking machine, M. A. Hicks	961,960
Milking machine pulsator, D. Brown	961,932
Moire machine, Johnson & Van Vlaanderen	961,863
Molding apparatus, T. H. Brown	962,002
Molding threaded objects, machine for, F. W. Engstrom	961,944
Motion transmitting mechanism, R. Zahn	961,830
Motor, A. F. Rockwell	962,254
Motor cooling means, A. F. Rockell	962,249, 962,250
Motors, feeding means for explosion, W. R. MacGuyer	962,371
Mower ditch, J. W. Yocum	961,995
Musical instrument, automatic, C. L. Davis	962,130
Musical instrument pedal mechanism, P. Welin	961,824
Musical instrument, stringed, P. L. Morris	961,883
Nitrobenzaldehyde, reduction products of commercial, A. Vagt	961,915
Number plate support for vehicles, W. B. Hughes	962,219 to 962,221
Nut lock, L. L. Swenson	961,819
Nut lock, L. B. Crouch	962,321
Nut lock, E. A. Hemsteger	962,347
Nut shaving machine, McFadden & Hiers	962,239
Offal bag for horses and the like, E. B. Gilpin	962,211
Oil burner, H. R. Green	962,212
Oil burner, Blackmond & Stoy	962,301
Oil burner, crude, R. C. Reed	961,797
Oiler, road, W. H. Gallor	962,209

Ores, apparatus for electrical treatment of, W. B. McPherson 962,040
Ores, treating, E. B. Parnell 962,383
Package, merchandise, H. N. Mann..... 961,873
Package tie, M. A. Bailey 961,833
Packing, Lutz & Bartlett 961,872
Packing tube, compressible, E. M. Dalley. 962,008
Padlock, J. Kuczynski 962,087
Paper box and fastener, W. S. Matthews. 961,784
Pavement, H. G. Jennison 962,150
Peat machine, P. Heseltine 962,349
Peat, preparing, W. H. Bradley 962,119
Peat preparing apparatus, W. H. Bradley. 962,120
Pen attachment, fountain, O. von Rottenburg 962,053
Percolator, R. E. Hughes 961,963
Percolator, coffee, J. H. Myers 961,886
Perforator, check, S. Schiff 962,167
Phonogram reproducing apparatus, W. F. Messer 961,980
Photometer, universal, T. Fujita 961,852
Piano, electrical, Rose & Holbrook 962,261
Piano panel protector, F. G. W. Paige... 962,043
Piano player actions, adjustable valve for, C. L. Davis 961,939
Pianos, music roll producer for self playing, D. M. Cloak 961,754
Pile driving machine, E. D. Tompkins..... 962,080
Pin, C. Kuehner 962,360
Pipe coupling, R. R. Rust 961,987
Pipe or rod connector, A. F. Miller..961,981, 961,982
Pipe union, Cash & Rorabeck..... 962,075
Pipe wrench, Kondas & Bajusz..... 962,359
Pipes, animal guard for, J. Bartlett..... 961,834
Pipes, means for cushioning hydraulic pressure in feed, R. D. Johnson..... 962,355
Planimeter, F. C. Blanchard et al..... 961,836
Planter, A. R. Gilmore 961,769
Plate lifter, G. Celli 962,196
Plate trimming shears, guiding apparatus for, Bierman & Keast..... 962,191
Platform, traveling, W. M. Sherwood..... 961,809
Pliers, blacksmith's, D. N. Tanner 961,989
Plow, R. R. Price 961,993
Plow, J. Buchanan 962,195
Plow fender, J. C. Skidmore 962,264
Plow, reversible, J. R. Rossetter 962,389
Plows, attachment for riding breaking, J. B. Harrell 962,342
Pneumatic despatch tube apparatus, L. G. Bartlett 962,072, 962,073
Pneumatic despatch tube carrier, A. W. Pearsal 962,045
Pneumatic spring, A. F. Rockwell..... 962,246
Pneumatic tube system, B. C. Batcheller... 961,909
Post brace, Thompson & Brice..... 962,271
Potato cutter, C. G. Marden 962,373
Potato grader, H. Peterson 962,048
Potato vine cutter, sweet, D. W. Lindsey. 962,367
Poultry drinking fountain, antifreezing, W. H. Ashcraft 961,831
Power drill, G. H. Condict 962,077
Pressure gage, L. J. Watson 962,107
Pressure governor, G. M. Richards..... 962,100
Print machine, F. J. Cleaver, Sr..... 962,128
Propeller, E. E. Furney 962,136
Propelling device, E. E. Lindkvist 962,155
Protective device, J. D. Hoffman..... 961,962
Pulley, H. Reed 961,796
Pump, C. A. Waltz 961,820
Pump, A. F. Rockwell 962,251
Pump bucket, chain, J. H. Burtner..... 961,933
Pump, centrifugal, J. Valk..... 961,953
Pump, centrifugal, A. E. Guy 962,023
Pumping oil wells, method and apparatus for, J. D. Dinsmoor 962,009
Punch, poultry marking, T. W. Rogers... 961,800
Puzzle, E. M. Peck 961,892
Puzzle, E. J. McFarland..... 962,039
Racing apparatus, A. Schumann 962,057
Radiator, S. D. Stauffer 962,061
Radiator, E. & H. Behringer 962,189
Rail anchor, W. A. Walker 961,918
Rail bonding apparatus, W. A. Neff..... 961,984
Rail joint, H. Kenyerres 962,028
Rail joint chair, H. Carmak 962,312
Rail support, T. E. Vaughn 961,917
Railway cattle guard, C. P. McKinney.... 962,379
Railway crossing, Gallaspy & McCarty.... 962,338
Raisin seeder, T. H. Elliott 962,201
Rake tooth point, H. A. Smith 962,060
Range, combined gas and coal, Roberts & Mander 962,244
Razor stropping device, C. F. Benedict.... 962,190
Receptacle having apparatus for projecting disinfecting material, etc., into it, C. Waldstein 962,067
Reeling machine, cocoon, V. V. Weber.... 962,279
Refractory compounds, reduction of, F. J. Tone 961,913
Refrigerating apartments and similar structures, door and doorway for, S. P. Stevenson 962,174
Rock drill, H. J. Hibschle 962,350
Rolling mill, tube, H. Stuting 961,818
Roost, poultry, I. T. Merchant 961,874
Rotary engine, Edwards & Olson..... 961,849
Rotary engine, G. E. Callaway 962,310
Rotary engine, compound reversible, H. Eriksen 962,204
Rotary explosive engine, Thomas & Bitter. 962,064
Rubbish burner, safety portable, W. M. Jackson 962,148
Safes, vaults, etc., attachment for combination dials on, M. Mosier 961,884
Safety pin making machine, H. B. Church. 962,126
Salmon smoking apparatus, H. Lindenberger 961,869
Salts and ammoniacal liquor, utilizing by-product metallic, F. J. Falding..... 961,764
Salts, making pure ortho and para guaiacol sulfonic, Seifert & Hahle..... 962,103
Sand, cleaning molding, R. Smith..... 962,265
Sap or gum extractor, J. T. Gilmer..... 961,953
Sash balance, E. J. Reilly 962,387
Sash, window, G. L. Whiteaker..... 961,919
Saw, portable power, Burdick & Jessop... 962,003
Sawing machine, portable, J. H. Longstreet 961,870
Scale, computing, R. A. Forbes 962,332
Scales, holder for interchangeable, J. W. Brigham 962,390
Screen mechanism, rotary, P. L. Scholl.... 962,168
Screw cutting device, L. F. Hart..... 962,024
Seal, bottle, J. V. Griffin 962,022
Seal, cording, E. J. Brooks 961,931
Sealing machine, carton, G. A. Cullom.... 961,845
Secondary battery, H. P. Schreiber..... 962,263
Separator, W. H. Bradley 962,117
Sewing machine attachment, V. E. D'Urso. 961,942
Sewing machine attachment, G. A. Graydon 962,021
Sewing machine tension device, C. Pedersen 961,893
Sewing machines, shuttle locking device for shoe, H. O. Fletcher 962,206
Shade and curtain hanger, H. J. Dempsey. 962,132
Shade and pole bracket, combined, N. B. Crosby 962,007
Shade fixture, window, W. G. Templeton.. 962,270
Shades, machine for making window, B. W. Tucker 962,178
Shafts or the like, sinking, D. E. Moran... 961,788
Sharpener, planer knife, C. O. Peterson... 962,047
Sheet metal plates and bands, manufacture of, A. Schwieger 962,058
Ship motion, passenger device for equalizing, A. W. Theilsiefje 961,911
Shovel and truck, combined, A. J. Compton 961,843
Shuttle, M. O. Steere 961,817
Shuttle threading machine, J. Faltus..... 962,327
Sieve bolter, gyrating, S. Snyder..... 961,814
Sifting apparatus, d'Orbessan & Louvet... 962,090
Signaling, electric, R. A. Fessenden..... 962,014
Signaling, method of, R. A. Fessenden.... 962,018
Signaling, receiver for electric, R. A. Fessenden 962,015
Silicon nitrid, making, A. Sinding-Larsen.. 962,170
Sink and float testing apparatus, G. R. Delamater 961,846
Sleigh, auto, O. J. Tubbs 962,272
Smelting furnaces, twyer receiver for, J. O. Bardill 962,112
Soap in lavatories, apparatus for the distribution of liquid, R. N. Sheldon..... 962,394
Soap receptacle, shaving, O. E. Pagan..... 962,091
Soda ash, tube for dissolving, W. H. Mussey 961,789
Soda, manufacture of bicarbonate of, R. H. F. Finlay 961,945
Sound recording apparatus, T. A. Edison.. 962,081

Sounding boards of stringed instruments, attachment for the, J. Sheldon 962,393
Spark igniter plug, jump, L. B. Cherry.... 962,314
Sparking apparatus, A. F. Rockwell..... 962,255
Spear, drive, Frampton & Bailey..... 962,020
Speedometer, D. M. Bell..... 961,835
Spring. See Bed spring.
Sprinkling device, J. F. Smith..... 961,906
Square, A. B. Jennings 962,149
Stacker, pneumatic, J. A. Walsh..... 962,092
Stalk cutter, L. Sanders 961,988
Steam engine, compound, H. H. Pilcher... 961,795
Steering apparatus, chain gear, A. Sundh.. 962,268
Steering device, A. F. Rockwell 962,257
Stitch separating and indenting tool, J. B. Hadaway 962,139
Stock drawer, R. S. Brown 962,122
Stocking, E. M. Newton 962,089
Stoker mechanism, P. L. Crowe..... 962,322
Stove and gas hot plate, combined, E. F. Hill 962,402
Stove board, G. Pfeil..... 962,093, 962,094
Stove, folding camp, H. H. Long..... 961,975
Stove leg, B. A. Baxter 961,928
Stovepipe coupling, E. J. Babbitt..... 962,298
Stovepipe fastener, G. G. Oswell..... 961,985
Strainer, closed fiber, E. W. Deming.... 962,324
Strainer, twin, W. S. Elliott..... 962,202
Straw dispenser, A. Berman 962,300
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